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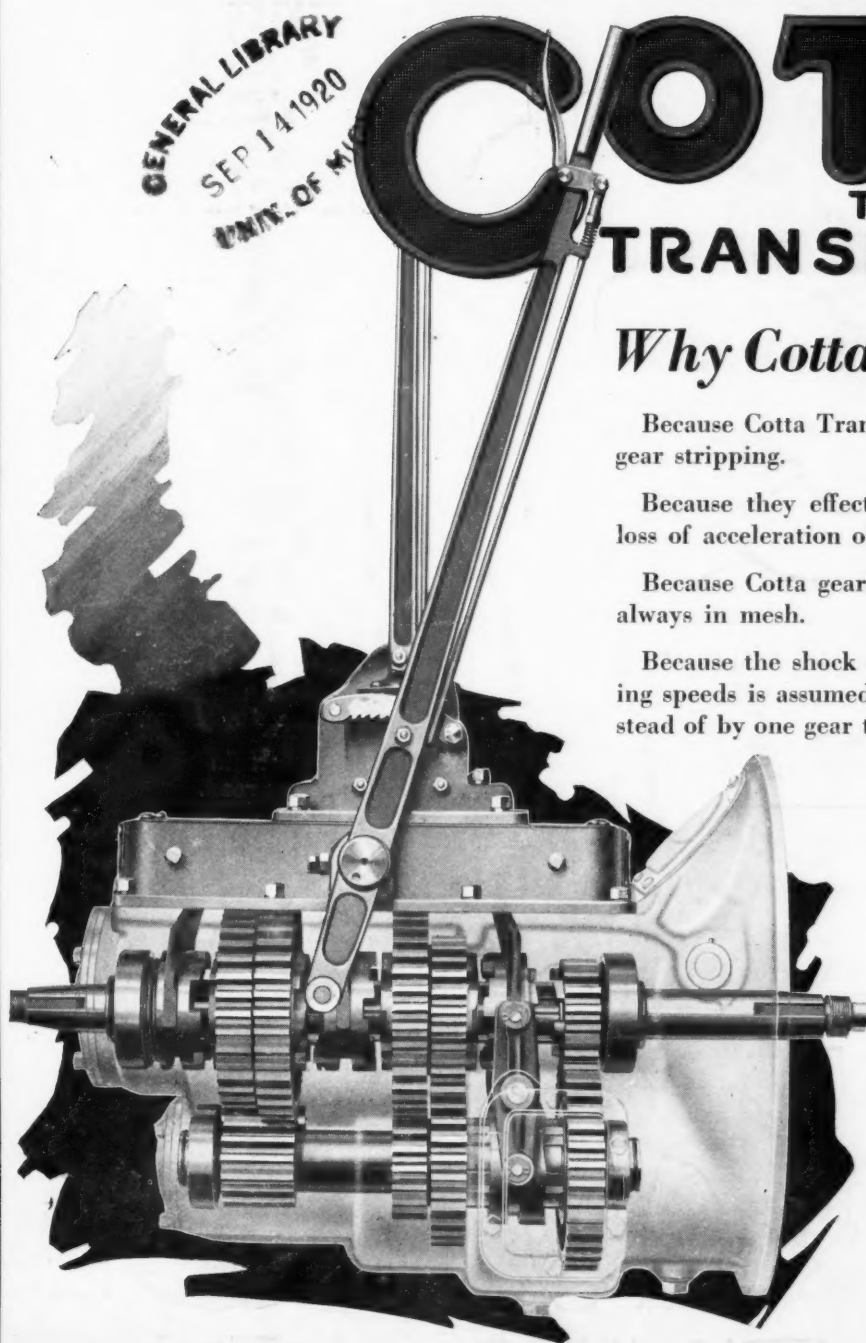
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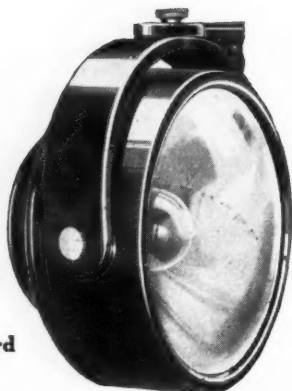
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# AUTOMOTIVE INDUSTRIES

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VOL. XLIII

NEW YORK—THURSDAY, SEPTEMBER 9, 1920

NO. 11

## German Government Will Create Standard Motor Fuel

Scarcity of gasoline restricts use of even the greatly lessened number of vehicles in that country and stagnation of industry is feared. The new fuel is outgrowth of experiments made during the war

By Benno R. Dierfeld\*

AT the present time there are in Germany about 32,500 passenger cars and 20,000 motor trucks, as compared with 65,000 passenger cars and 12,000 trucks at the beginning of 1914. There are also nearly 9500 motorcycles, as compared with 22,500. Assuming the monthly fuel consumption of a passenger car to be 200 kg., and that of a truck 500 kg., Germany would require a monthly fuel supply of 18,000 tons, if the present governmental interdiction of motoring were rescinded. However, the Government has at its disposal only 7000 tons per month, and in the opinion of its experts this supply cannot be materially increased by importation, on account of the unfavorable rate of exchange, the shortage of tankage, the war in Poland and (last but not least) the indications that foreign countries, including the United States, will experience a fuel shortage during the next several years.

For this reason the German Government has decided to create a standard fuel, which is to consist of a mixture of very heavy hydrocarbons that alone are unserviceable as motor fuels, with such lighter products as gasoline and benzol. Benzol is

produced in Germany and sold at the price of 500 marks per 100 kg. (54 cents per lb., nominal exchange) and a small amount of gasoline is to be imported; these two fuels are to serve only as means of adapting the heavy fuels above mentioned, which latter are to be imported in large quantities and can be had at a very low price.

The situation is indeed very serious, and the Association of German Motor Car Manufacturers has urgently petitioned for the repeal of the embargo on fuel imports, or any other likely solution of the fuel problem. It is asked that suitable steps be taken immediately to relieve the situation, as otherwise the manufacturers would be compelled to close their factories for want of orders. Certainly, the locking out of many thousands of workers during the present period of unrest would involve great political dangers.

Fortunately, German chemists had ample opportunity during the four years of war to develop substitute fuels for gasoline vehicles, and a satisfactory solution of the fuel problem can be looked forward to with confidence. In the following the practical results of the scientific researches on fuel substitutes for motor cars carried on by German chemists and engineers will be discussed.

\*Mr. Dierfeld, an occasional correspondent of AUTOMOTIVE INDUSTRIES, is rated as an authoritative writer on automotive subjects in Germany.

Some weeks ago British automobile papers published a government report on the suitability of benzol as a motor fuel. The conclusion was reached that benzol could indeed be used in motor vehicles, but it was not recommended for general use. Now, this conclusion is rather curious, in view of the facts that the service of the German Motor Transport Corps and the operation of motor cars behind the German front during the long war was rendered possible only by the extensive use of benzol, and that the latter to-day is one of the best motor fuels available in Germany, which will mostly be used and mixed with cheaper, lower grade fuels, on account of its scarcity.

Benzol is a by-product of the gasification of coal, and can be produced, therefore, in all countries possessing coal mines, or using coal gas for illumination. While the gasolines are indefinite and variable mixtures of the paraffin series of hydrocarbons (from butane to octane, etc.), benzol is a nearly constant mixture of aromatic hydrocarbons. For example, the so-called 90 per cent motor-benzol consists of about 84 per cent benzol, 13 per cent toluol and a slight amount of tiophene. During the war toluol was removed for other purposes, and the benzol was used without toluol. Gasoline is unaffected by acids and alkalies, while benzol is chemically active, which fact is valuable from a research standpoint.

Standard gasolines, in a chemico-physical sense, do not exist; the commercial gasolines are not uniform distillates and are distinguished only by their weight as light, medium and heavy gasolines, which designations are rather indefinite. There are, however, standard benzols in Germany. In the first place, there is the ordinary 90 per cent motor benzol, compounded in such a manner that 90 per cent will distil over at 100 deg. Cent., which property is of importance from the standpoint of its use in motor vehicles. The end points of this benzol are comparatively close together (176 and 248 deg. Fahr.) and the lower boiling point is quite low, which facilitates starting of the engine.

The Benzol-Union at Bochum during the war manufactured the following three standard grades of motor benzol:

1. 75-85 per cent, 90 per cent purified benzol—15-25 per cent purified toluol.
2. 75-85 per cent, 90 per cent purified benzol—15-25 per cent purified solution benzol.
3. 75-80 per cent purified benzol—10 per cent purified solution benzol and 10-15 per cent purified toluol.

The distillation curves of these motor benzols lie very close together, No. 1 distilling over at between 185 and 248 deg. Fahr.; No. 2 between 185 and 270 deg. Fahr. and No. 3 between 185 and 280 deg. Fahr. so that they can be properly called standard benzols.

The specific gravity of gasoline varies from 0.680 to 0.750, while that of motor benzol is almost constant (0.860-0.880). Furthermore, benzol is chemically active and can be readily analyzed by any novice by means of a simple device designed by Prof. Dietrich, a well-known chemist and an authority on benzol. On the contrary, tests of gasoline by a layman are practically out of question.

The proportion of carbon in gasoline is about 85 per cent, in benzol about 92 per cent; the proportion of hydrogen in gasoline is about 15 per cent, in benzol about 8 per cent. The greater proportion of hydrogen in gasoline is valuable in so far as it extends the range of inflammability of gasoline-air mixtures, especially in the direction toward rich mixtures. This, however, may also be considered a drawback, for it leads to fuel waste. Benzol, with its lower proportion of hydrogen, will not ignite if the mixture is too rich, consequently it compels a more economic use. The higher carbon content of benzol is therefore an advantage.

The quantity of air needed for combustion is arrived at by the following consideration: The carbureter delivers fuel through its jet, not by weight but by volume; consequently, in calculating the fuel furnished by the jet, we must figure in terms of volume and not of weight. Now, the amount of air required to burn one liter of benzol is greater than that required to burn one liter of heavy gasoline. Therefore, even theoretically the benzol jet must be smaller and the fuel delivery less than with gasoline. Practical tests have confirmed this conclusion, as mentioned further on. The calculated amount of air required is 11.7 cubic meters for 1 kilogram of gasoline (188 cu. ft. per lb.) and 10.0 cubic meters for 1 kilogram benzol (160 cu. ft. per lb.). In practice, benzol requires about 20 per cent more air, for the reasons above mentioned. It may be added that a 10 per cent surplus of air gives the maximum power and a 20 per cent surplus of air, maximum fuel economy.

The boiling points of gasoline vary with the different grades (light, medium, heavy) from 122 to 300 deg. Fahr. and beyond. The boiling points of motor benzols are more closely limited, extending only from 176 deg. to 248 deg. Cent. Therefore, benzol is the more uniform fuel. The freezing points of gasoline lie below 4 deg. Fahr.; therefore, no grade of gasoline will congeal. Pure benzol congeals at 32 deg. Fahr. and commercial benzol at about 23 deg. Fahr. In this, of course, gasoline has an advantage, but mixtures of one-third gasoline and two-thirds benzol (or benzol and toluol) or of two-thirds benzol and one-third alcohol congeal below 4 deg. Fahr. These mixtures, called "winter benzols," have been used in the German army and in commercial transportation for several years.

As above mentioned, all calculations concerning fuels should be on a volume and not on a weight basis. Now, the respective heat values of gasoline and benzol, according to researches of Otto Ostwald, are as follows:

Gasoline, 0.720 sp. gr.

- 1 kilogram contains 10,500 kilogram-calories.
- 1 liter contains 7550 kilogram-calories.

Benzol, 0.880 sp. gr.

- 1 kilogram contains 9600 kilogram-calories.
- 1 liter contains 8480 kilogram-calories.

Consequently benzol contains more heat than gasoline on a volume basis.

The rate of flame propagation with gasoline is 2.5 meters per second (500 ft. p. m.), while with benzol it is much less; this allows a greater amount of preignition in the motor, the troublesome knocking disappears and the motor is more flexible.

The more rapidly and the more uniformly a fuel evaporates, the more suitable it will be for motoring purposes. According to the researches of Prof. Dietrich, 10 cu. cm. of best light gasoline evaporates at mean indoor temperature in less than two hours; good, medium gasoline in about two hours, and heavy gasoline in 2½ to 3 hours or more. Good motor benzol evaporated in 3½ hours in the most favorable case. However, the distillation curve of benzol is more uniform and more nearly vertical than are the curves of medium and heavy gasoline, while light gasoline evaporates very fast at the beginning but more slowly later on. Now, modern carbureters require fuels that evaporate uniformly, and the drawback of a longer evaporating time for benzol is balanced by the advantage of its more uniform evaporation.

Theoretically the danger of explosion, i.e., the risk of the formation of explosive air fuel-mixtures, is 1½ times as great with benzol as with gasoline; this apparent drawback of benzol does not amount to much, however, because in practice benzol evaporates not only more uniformly but also more slowly than good gasoline (light or medium),



and, of course, this diminishes the danger of forming explosive mixtures. The electrical excitability of gasoline is so high that in order to avoid explosions caused by friction in conduit pipes, soluble soaps or acetic acid must be added. This excitability is much less with benzol, which, of course, is an important advantage.

The flash point of gasoline is considerably lower than that of benzol. During the warm season the motor starts on benzol as well as on light or medium gasoline, but much better than on heavy gasoline. Of course, the carbureter must be correctly adjusted for benzol.

As to the proportion of water in the two fuels, this is given in the following table, which is due to the chemist, Wa. Ostwald:

Temperature in Deg. Cent.	Per Cent of Water in Benzol.	Gasoline.
5	0.034	0.003
25	0.072	0.007
50	0.061	0.025
75	0.318	0.057

Benzol, it will thus be seen, contains more water than gasoline, and probably this has a favorable effect on the combustion in the cylinder. However, by cold storage the proportion of water in benzol can be considerably diminished, as may be seen from the table.

The smell of benzol is more aromatic than that of gasoline, especially that of the heavy gasolines, which smell like kerosene; the exhaust gases of the two fuels are about the same. Incorrect adjustment of the carbureter can be perceived more easily with benzol, because the exhaust gases then are black and sooty. Gasoline vapors are more poisonous than those of pure benzol; the vapors of crude benzol, however, are more poisonous than those of gasoline. The pathological symptoms are generally more serious in a case of gasoline poisoning than in case of benzol poisoning.

A fuel tank of about 100 liters capacity contains 70 kilograms of gasoline, or 86.5 kilograms of benzol. The same size tank, therefore, allows carrying a greater quantity of benzol, and consequently of covering a longer distance.

The relative consumptions of gasoline and benzol have been carefully compared in different scientific tests. The well-known chemist and driver Ostwald obtained the following results:

German Tax Rating Hp.	Brake Hp.	Approximate Fuel Consumption in Liters Per 100 Kilometers	
		Gasoline	Benzol
3.8	8	9	7
6.0	20	12	10
8.0	24	17	10
10.0	32	20	13
11.4	34	22	14
19.0	40	24	17
22.8	45	28	21

The fuel consumptions of cars whose carbureters are adjusted for maximum economy are, according to the same authority:

German Tax Rating, Hp.	Consumption in Liters Per 100 Kilometers	
	Gasoline	Benzol
5	8	7.3
6	10	9.0
7	12	9.9
8	13	11.0
10	16	14.5
15	21	19.4
20	25	23.0

Professor Von Loew obtained the following results:

	Kilometers Per Liter	Fuel Cost, Marks Per Liter	Fuel Costs, Kilo- meters Per Mark
Gasoline	5.8	0.38	15.7
Benzol	7.1	0.375	18.9

Summarizing, the consumption of benzol is considerably less than that of gasoline, and the economy is better; the latter could be improved materially if benzol, instead of being used in standard gasoline motors, were used in motors specially designed for burning benzol, with high compression.

The question as to which of the two fuels has the

greater value is answered by the German Benzol Union as follows:

Gasoline 0.720 sp. gr.	Benzol 0.880 sp. gr.
1 kilogram contains 10,500 calories.	1 kilogram contains 9,600 calories.
1 liter contains 7,550 calories.	1 liter contains 8,480 calories.

If the price of 1000 calories is taken at 0.05 mark, the cost of the two fuels is the same if 1 kilogram of gasoline costs 0.52 mark and 1 kilogram of benzol costs 0.48 mark, or if 1 liter of gasoline costs 0.37 mark and 1 liter of benzol costs 0.42 mark. That is to say, 1 kilogram of gasoline that costs 0.52 mark is no more expensive than 1 kilogram of benzol at 0.48 mark, and 1 liter of gasoline at 0.37 mark is no cheaper than 1 liter of benzol at 0.42 mark.

Previous to the war the price of benzol was considerably lower than that of light or medium gasoline, and the relation will undoubtedly be again the same in the future.

### Mixture of Benzol and Heavy Oil

The German fuel named "Benzol oel," or "Benzol-Treib-oel," is a mixture of 50 per cent crude benzol with 50 per cent gas oil, or heavy mineral oil; its color varies from yellow to reddish brown, the smell is suggestive of benzol and tar oil, and the specific gravity varies from 0.840 to 0.985, while the distillation temperature ranges from 144 to 570 deg. Fahr. Benzol can be mixed with gasoline and in some cases with alcohol and benzol-alcohol mixtures; it evaporates more slowly than benzol or benzol-alcohol. Of course, the use of this heavy fuel requires some precautions.

The carbureter nozzle should be chosen as small as possible, and the resulting difficulty in starting the motor must be overcome by filling the float chamber with unmixed benzol, by injecting benzol through the pet cocks, by pre-heating of fuel and carbureter air, by taking off the fan belt, etc. During cold weather, hot water should be poured into the radiator, its lower part covered with a rug or cardboard, and the fan disconnected.

All extending idling of the motor, as well as incomplete combustion, must be avoided, so that no carbon deposit will form on the cylinder walls, valves, etc. Spark plugs and carbureter must be cleaned at frequent intervals. Carbureters with adjustable fuel level and adjustable or quickly interchangeable nozzles are best adapted for this fuel, which is now employed in the majority of German cars.

The distillation curve of the benzol-oil mixture, when compared with that of unmixed gas oil and crude benzol, shows clearly that the addition of benzol not only reduces the boiling point of the low boiling fractions, but also that of the whole mixture. The result is a tolerably uniform distillation curve, which corresponds with the favorable behavior of this mixed fuel in the engine.

### Mixture of Benzol and Kerosene

A few months ago a mixture of benzol and kerosene was recommended for use as substitute for the benzol-heavy oil mixture mentioned above. The new mixture consists of 40 per cent benzol and 60 per cent motor kerosene, which latter is distilled from heavy oils. The kerosene thus produced commences to boil at about 350 deg. Fahr., while the boiling point of lamp oil is 300 deg. Fahr. or lower. As the boiling point of kerosene is much lower than that of gas oil, the benzol-kerosene mixture gives much better results in the motor than the benzol-heavy oil mixture, and its distillation curve is flatter. The difference between the boiling point of the lighter and heavier portions is less with this new mixture than with the benzol-heavy oil mixture, which fact tends to promote uniform combustion of the fractions with less residuum.

The new mixture is colorless or has a yellowish color,

smells like benzol and when being rubbed on the hands like kerosene. Starting a cold motor is as difficult with this mixture as with a benzol-heavy oil mixture, but the combustion is much better; the motor remains clean and the exhaust gases are colorless and almost inodorous. At the recent official German carburetor trials the merits of the new mixture were universally acknowledged. Cleanliness of the cylinders and spark plugs, a colorless exhaust and a somewhat smaller fuel consumption per kilometer than with the heavy oil mixture were the features particularly noted.

#### Mixture of Benzol and Alcohol

As early as 1902 alcohol was used in Germany as a motor fuel, but the difficulties encountered were too great, so that gasoline continued in use until 1914-15. The modern motor, with its long stroke, higher compression, higher cooling water temperature and with its two-jet carburetor, is far better suited to alcohol and alcohol mixtures. The only difficulty is the starting of the cold motor, for which purpose a small starting tank with benzol or gasoline is provided. Alcohol shows some surprising properties when used as a motor fuel; its heat value is only about two-thirds that of benzol, but the power of the engine is the same with alcohol as with benzol. This is explained by the fact that a relatively much greater amount of air is needed for burning benzol than for burning alcohol, and hence the ratio of fuel to air in the combustible mixture must be greater with alcohol.

Mixtures of alcohol and benzol work very well in modern motors. Prof. von Loew has tested such mixtures under different conditions (see Tables I and II).

TABLE I. FULL POWER OF THE MOTOR IN HILL CLIMBING

	Maximum Speed	Distance Covered with 1/2 Liter
Ethyl alcohol .....	30	1,070
Methyl alcohol .....	38	1,030
Gasoline .....	40	1,350
Benzol .....	40	1,460
1 Benzol + 1 alcohol .....	40	1,470
1 Benzol + 2 alcohol .....	38	1,350
1 Benzol + 3 alcohol .....	35	1,190
1 Benzol + 4 alcohol .....	30	1,060
1 Benzol + 5 alcohol .....	30	1,030
1 Benzol + 1 kerosene + 1 alcohol .....	40	1,020

TABLE II. ECONOMY TESTS ON LEVEL ROAD AT A SPEED OF 40 KILOMETERS PER HOUR

Used Fuel	Distance Covered with 1 Liter Fuel Kilometers	Price Per Liter Mark	Distance Covered on 1 Mark's Worth Kilometers
Gasoline .....	5.8	0.38	15.7
Benzol .....	7.1	0.375	18.3
1 Benzol — 1 alcohol .....	7.5	0.358	20.9
1 Benzol — 2 alcohol .....	7.2	0.352	20.4
1 Benzol — 3 alcohol .....	7.0	0.349	20.0
1 Benzol — 4 alcohol .....	6.6	0.377	19.0
1 Benzol — 5 alcohol .....	6.0	0.345	17.3
Alcohol .....	5.4	0.34	15.8
1 Benzol — 1 kerosene — 1 alcohol .....	7.3	0.31	23.5

In Table II are given the fuel prices obtained before the war. The benzol-kerosene-alcohol mixture shows the best results, and Prof. von Loew, who is a keen motorist, prefers this mixture even to pure gasoline and benzol, because the water content of the mixture obviously has a favorable effect on the power and the running of the engine.

#### Solution of Naphthalene in Benzol or Gasoline

The laboratory of the Dresden Technical University has performed interesting tests with such solutions. Gasoline is not very suitable as a solvent, because its solving power decreases with the temperature. A solution of 10 weight parts of naphthalene in 100 parts of gasoline has a saturation temperature of about 39 deg. Fahr.; cooling the solution to about 8 deg. Fahr. would cause half the naphthalene to crystallize. Benzol is better

adapted for this purpose; at 32 deg. Fahr. 30 weight parts of naphthalene still remain dissolved in 100 parts of benzol. At 14 deg. Fahr. 21 weight parts of naphthalene are dissolved, and with lower proportions of naphthalene the latter serves to depress the congealing point. While the benzol serving as solvent congealed at 29 deg. Fahr., the addition of 10 weight parts of naphthalene lowers the congealing point to 21 deg. Fahr., and the addition of 20 weight parts of naphthalene gives a solution which will congeal only at 14 deg. Fahr.

Supposing that 1 kilogram of the fuel, consisting of 10 weight parts of naphthalene and 100 weight parts of benzol, is combined with 14.3 kilograms of air in the carburetor, the saturation temperature of naphthalene vapor at atmospheric pressure, then, is 134.5 deg. Fahr. At this temperature the fuel-air mixture must be kept, if solid precipitations of naphthalene are to be avoided.

A 35-hp. motor truck was tested with this mixture, composed of 10 parts naphthalene and 100 parts benzol, after having been prepared in the following manner:

- The radiator front was partially covered with an adjustable shutter so that the cooling water had a higher temperature.
- The carburetor was protected by a sheet-iron screen from the direct current of the fan air.
- The inlet manifold of the motor was wrapped with sheet asbestos.

This truck was loaded and run in the hilly district around Dresden for several hours; the result was entirely satisfactory, as the motor neither stalled nor missed, but retained its full power during the whole time, and no precipitations of naphthalene were visible at the carburetor and in the detached manifold. Thermo-elements were located at different points of the air-supply tube and inlet manifold, and gave a good control over the temperature conditions of these parts.

#### Acetylene and Acetylene Mixtures

In countries where abundant water power allows of the cheap production of calcium carbide, the question of acetylene as motor fuel is important, and German engineers were not slow to try out this new fuel. The specific gravity of pure acetylene is 0.906 (sp. gr. of air = 1); it can be dissolved in many liquids, such as alcohol, acetone, etc., and increasing pressure, as well as decreasing temperature, augment its solubility. A solution of acetylene in acetone is known as "dissolved acetylene," and is well known to motorists. The heat value of acetylene, compared with that of the ordinary motor fuels, can be seen from the following table:

Fuel	Calorific Value of 1 Liter Calories	1 Kilogram Calories
Benzol .....	8,500	9,500
Gasoline .....	7,500	10,500
Acetylene .....	14,000	12,200

In practice 1 kilogram of calcium carbide (with about 1 liter of water) produces 350 grams (= 300 liters) of acetylene, so that the production of 1 kilogram of acetylene requires at least 2.9 kilograms carbide, and 1 cubic meter of acetylene requires no less than 3.3 kilograms of carbide. Therefore, the heat value of 10,000 calories is contained in about 2.4 kilograms of calcium carbide. Acetylene-air mixtures in the proportion of 3.4 per cent up to 52.3 per cent of acetylene are explosive at normal temperature and normal pressure; on account of the high heat value of acetylene, heavy explosions will sometimes occur, due to decomposition and without air addition. Therefore, the utmost precaution must be observed in the use of acetylene, especially on account of the danger of self-ignition, which occurs at as low a temperature as 715 deg. Fahr. or at 3 atmospheres pressure.

Pure acetylene is well adapted for motor-car service,



## Carbureter Adjustment Chart

Factor Observed	Composition of the Air-Fuel Mixture			
	Too Poor	Economical Operation	Maximum Power	Too Rich
Power of engine	Low	High	Very high	Low
Fuel consumption	High, on account of using low gears	Low	Average	High
Starting of cold engine	Popping and blowbacks in carbureter, which disappear when depressing the float, but return later	Popping in carbureter and low power; both disappear upon adjustment of hot air device or upon heating the engine	Blowback in carbureter, which disappears quickly	Faultless running of motor; with very rich mixture, explosions in muffler; soot and smell of fuel in exhaust
Engine cold. Throttle quickly opened	Motor stalls	Popping in carbureter	Not full power	Good running of motor, possibly popping in carbureter and explosions in muffler
Engine moderately warm. Throttle quickly opened	Popping in carbureter	O. K.	O. K.	Popping in carbureter and explosions in muffler
Engine idling at moderate temperature	Sneezing of carbureter	Idle running O. K.	Idle running O. K.	Sneezing of carbureter and explosions in muffler, soot and smell of exhaust
Spark plugs in hot engine after running on full throttle	Not oily; insulating core burnt red	Not oily; insulating core burnt red	Not oily; core grey or black	Black or oily
Color of valves in hot engine after running under full throttle	Inlet gray, exhaust red	Inlet gray, exhaust red	Inlet black, exhaust black	Inlet black, wet and oily; exhaust black
Exhaust	Colorless; when over-oiling oil smoke disappears quickly. Clean spark plugs when over-oiling	Colorless; over oiling is shown by white oil smoke oily plugs and valves	Colorless; over-oiling is shown by white oil smoke oily plugs and valves	Black smoke; over-oiling soon causes trouble
Exhaust flame and temperature	Flame blue and long, exhaust pipe at engine almost red hot	Flame blue and short, exhaust manifold intensely red	Exhaust flame weakly luminous and longer; exhaust manifold intense red	Exhaust flame luminous and very long, exhaust manifold and pipe intensely red
Flame at compression cock while opening throttle and idle running of warm, not over oiled engine	Misfires; flame long and light blue	Blue, short flame	Flame weakly luminous, bluish and somewhat longer	Flame luminous and long; upon disconnecting the spark plug an oily moisture accumulates on the finger held over the cock opening
Screwing in spark plug with carbon deposit at insulating core and driving the car with throttle full open for some kilometers	Insulating core burnt red	Insulating core burnt red	Insulating core black	Spark plug unaltered or worse
Closing of fuel tap and continuing with driving	Quick popping in carbureter	Power of engine quickly diminishes with popping of carbureter	Power does not diminish noticeably until shortly before stalling of engine	Power increases until shortly before stalling of engine
Depressing the carbureter float while driving the car	Power of engine increases	Power of engine increases a trifle	Power of motor diminishes	Power diminishes; explosions in muffler
Rag or piece of cloth loosely put into air-inlet of carbureter	Power of engine increases	Power of engine increases a trifle	Engine runs badly	Explosions in muffler; diminished power
Gasoline car driven on benzol	Runs well	Runs very well	Troubles	Exhaust sooty
Benzol car driven on gasoline	Popping in carbureter	Power diminished	Runs well	Runs quite well
Benzol-alcohol car driven on benzol	Runs well	Soot	Troubles	Stalls on account of over-oiling
More pre-heating of mixture	Somewhat more power	Somewhat more power	Power diminished	Power diminished or non-uniform running; soot
Less pre-heating of mixture	Popping in carbureter	Popping in carbureter and less power	More power	More power; troubles disappearing

on account of its high heat value and the ideal quick starting of the motor, but the danger of excessively heavy explosions and of self-ignition require some precautionary measures. Too heavy explosions and self-ignition can be avoided by a large surplus of air, but in this case the power of the motor is 20 to 30 per cent less than with gasoline and 30 to 40 per cent less than with pure acetylene. The injection of water into the motor cylinders prevents self-ignition and cools the mixture, but an obstacle to the use of pure acetylene in motor cars is the great weight of the fuel which amounts to from 120 to 180 kilograms of carbide and water for a distance of 100 kilometers (420 to 630 lb. per 100 miles); a further drawback is the necessary care and cleaning of the generators.

Dissolved acetylene is more advantageous, but its dryness has an injurious effect; the pressure of the gas can be easily regulated by the valve. The steel bottles, however, have only limited contents and the weight of the reserve bottles is a decided disadvantage.

Acetylene can be used to best advantage as a supplementary fuel. The carbureter of the engine is fed with benzol, kerosene, tar oil or any other heavy oil, and in addition to this the acetylene gas is supplied, which results in better starting of the engine and greater force of explosion on account of its higher heat value. The acetylene is produced in a special generator, and with one charge of carbide a 30-hp. car covers a distance of 50-70 kilometers (30-45 miles), consuming at the same time about 20 per cent of liquid fuel. This mixed fuel can be used by reducing the size of the carbureter main jet to one-fifth or one-sixth, placing the automatic acetylene-air mixing valve in the air inlet of the carbureter and putting the generator, connected with this valve, on the footboard of the car. The cost of this composite fuel is said to be from one-fourth to one-third of that of benzol at present carbide prices. The driving of a car with this arrangement is almost the same as with gasoline, smooth running and flexibility of the motor being particularly noticeable. Quick starting, cleanliness of the cylinders and spark plugs, somewhat reduced lubricating oil consumption and colorless, inodorous exhaust are further advantages.

#### Adjusting the Carbureter for Different Fuels

As above outlined, a great number of different fuels are being used to-day in Germany, and instructions concerning carbureter adjustment which are easily understood by the average driver are necessary. The appended table, compiled by the chemist Ostwald, a motorist of long years' experience, answers this purpose very well and will interest drivers of gasoline cars.

In the table fuel-air mixtures are distinguished as follows: Too rich mixture—with less than 10 per cent surplus of air. Maximum power mixtures—with 10 per cent surplus of air. Economical mixture—with 20 per cent surplus of air. Too poor mixture—with more than 20 per cent surplus of air.

This corresponds with practical experiences and brake tests. Furthermore, the best temperatures of the air-fuel mixtures are accepted to be as follows:

Gasoline, about 86 deg. Fahr., consequently lukewarm.  
Benzol, about 95 deg. Fahr., consequently hand warm.  
Benzol-kerosene, about 122 deg. Fahr., consequently just bearable to touch.

Benzol to about 140 deg. Fahr., consequently hardly bearable to touch.

Alcohol to above 140 deg. Fahr., consequently hot.

The best mean cooling water temperatures with the different fuels are as follows:

Gasoline, about 158 deg. Fahr.

Benzol and benzol-kerosene about 176 deg. Fahr.

Benzol-alcohol and alcohol about 194 deg. Fahr.

In practice the table is used in such a manner that the driver of the car employs several (at least three) modes of testing, described in column 1, and watches the results. The symptoms represented in the four columns, then, show clearly whether the air-fuel mixture is too rich or too poor, etc., and the table indicates what should be done to correct it. This table was adopted by the German Motor Transport Corps.

Another simple method of testing the adjustment of carbureters has been discovered by Prof. Kutzbach of Dresden, of aircraft engine fame, who proceeds from the heat content of a cylinder full of combustible mixture. If 1 kilogram of gasoline with lower heat value of 10,000 kilogram-calories is mixed with the theoretically required 12.5 kilograms of air in such a manner that a homogeneous gasoline-air mixture is produced, a cubic meter of this mixture contains

$$\frac{10,000}{12.5} = 800 \text{ kilogram-calories}$$

not taking into consideration the space needed by the liquid fuel. This value refers to air at 32 deg. Fahr. and atmospheric pressure and must be corrected for aircraft engines by a factor corresponding to the change of air pressure at different altitudes. In automobile service, however, this correction is not necessary.

Bearing in mind the fact that in ordinary operation the engine cylinders are not completely filled with mixture, but only to about 80 or 85 per cent, 1 cubic meter of the cylinder volume does not contain 800 kilogram-calories but only 640 to 680 kilogram-calories, and if the mixture is not formed with the theoretically required quantity of air, but, as usual, with a surplus of about 10 per cent of air, it contains only 580 to 620 kilogram-calories. That is to say, if an engine works with the most economical mixture containing 10 per cent excess air, one cubic meter of the cylinder volume contains from 580 to 620 kilogram-calories. If the heat capacity of this volume is higher, the mixture is too rich. If it is lower, the mixture is too poor. The practical calculation for an engine is as follows:

If  $F$  is the fuel consumption of the engine and  $C$  its lower calorific value, the product  $F \times C$  represents the total heat consumption of the engine in kilogram-calories for the hour; if the engine speed is  $n$  revolutions per minute (i.e.,  $60 \times n$  revolutions per hour), if the capacity of one of its cylinders is  $V$  cubic meter, and the number of cylinders is  $i$ , then these cylinders draw in

$$\frac{60 \times n}{2} = 30 \times n$$

per hour and contain altogether  $i \times V \times 30 \times n$  cubic meters of mixture. Consequently, the heat content of the mixture per cubic meter piston displacement is

$$\frac{F \times C}{i \times V \times 30 \times n}$$

This value can be calculated, if bore and stroke of the cylinders as well as the lower calorific value  $C$  are known, and the fuel consumption  $F$  per hour of the engine and its number of revolutions  $n$  are determined. With gasoline, if this formula yields a value above 620 kilogram-calories, then the engine certainly works with too rich a mixture. If the value is less than 580 kilogram-calories, then the mixture is too lean. The range of 580 to 620 kilogram-calories can be used also for benzol or benzol-heavy oil and benzol-kerosene mixtures. For alcohol, however, the figures must be changed on account of its considerably lower calorific value.

This method is simple and very accurate, as proved by tests of aircraft engines.



# Paige Announces New Engine for Big Six Model

This power plant, at present a Continental Motors Corp. product, is soon to be manufactured in the Paige shops. It is an L-head type,  $3\frac{3}{4}$  by 5 in., six cylinder, block-cast unit with separate cylinder head, aluminum crankcase and pressed steel oil pan. Changes also made in propeller shaft.

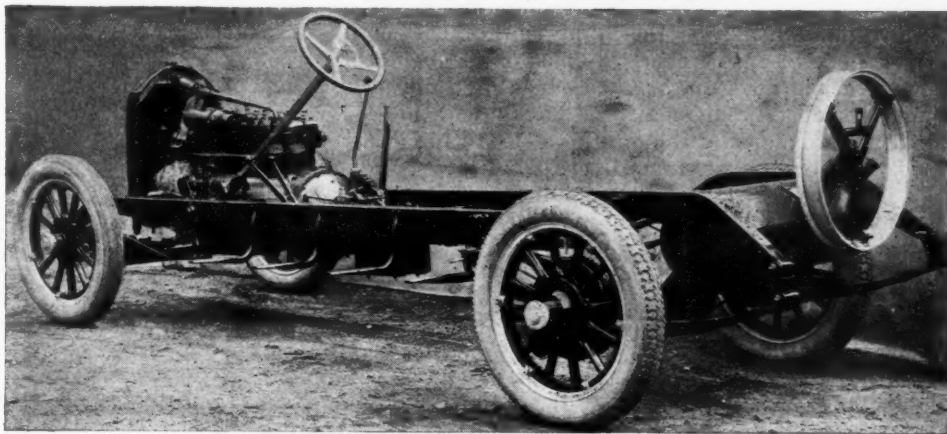
By J. Edward Schipper

**A** NEW Paige model, supplanting the present Big Six, is just beginning to come through the factory. This new model with the present light six, which remains unaltered, will make up the Paige line for 1921. The new model has an entirely new engine, a new propeller shaft and universal construction, and a new rear end. An entirely new line of bodies has been designed, comprising a sedan, coupé, sport model and seven-passenger touring. The chassis has a 131 in. wheelbase. In addition to these new cars, the Paige company has brought out a new sport body for its light six.

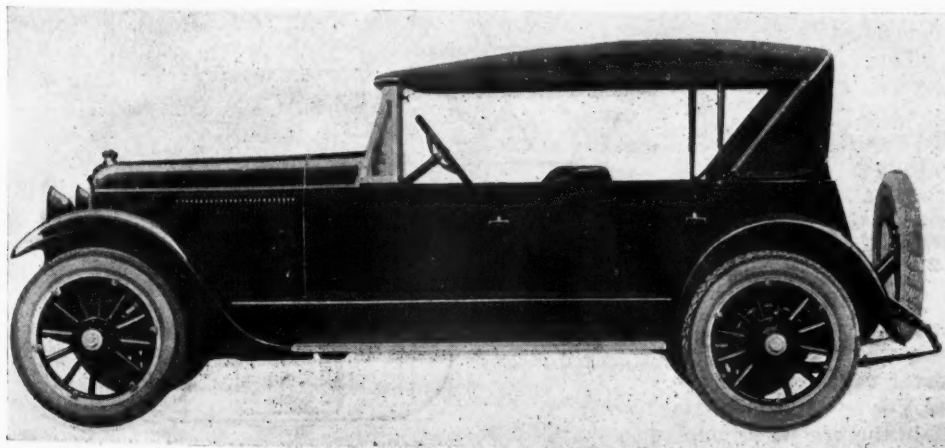
The new engine, which is the feature of the latest Paige, is manufactured by the Continental Motors Corp. It is known as the Continental 7-A, and, with the exception of arrangements for taking care of the Paige clutch, will be a Continental stock model, superseding the Continental 9-N. It is planned, however, by the Paige company to eventually build this engine in its own shops. It is an L-head,  $3\frac{3}{4}$  by 5 in. six-cylinder, block-cast unit, with separate cylinder head, an aluminum crankcase and a pressed steel oil pan. The engine is rated at 33.75 hp. S. A. E., but the brake test shows 43.5 hp. at 1000 ft. per min. piston speed, 36 hp. at 1000 r.p.m. and 70 hp. at 2200 r.p.m., which is the approximate peak point. This unit has a piston displacement of 55.25 cu. in. per cylinder, giving a total of 331.50 cu. in. The combustion

chamber volume is 17.2 cu. in. per cylinder, the clearance ratio being 23 per cent and the compression 65 lb. per sq. in. The engine weighs 675 lb.

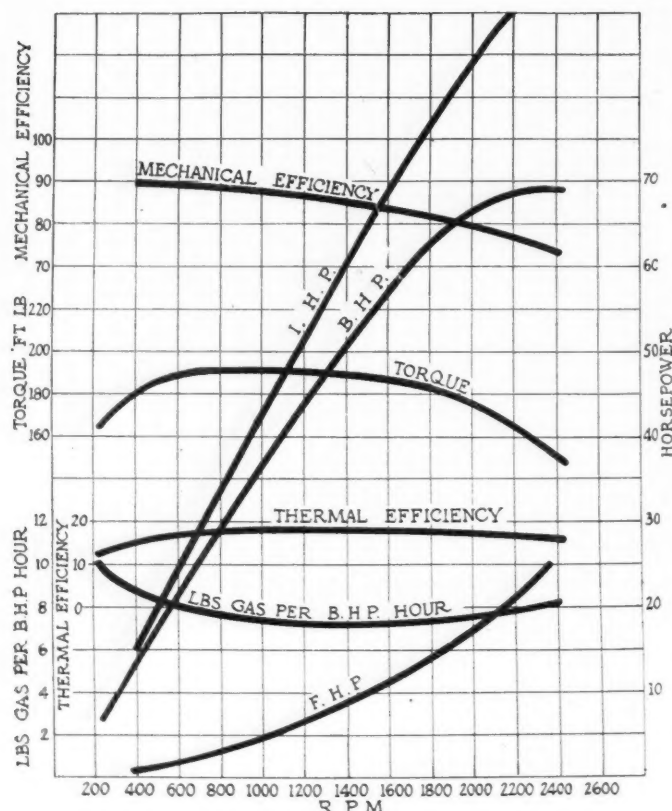
The use of an independent head and crankcase gives three main castings, which makes machining easy and generally favors production. The pistons are gray iron castings,  $4\frac{1}{2}$  in. in length, having three  $\frac{3}{16}$  in. rings per cylinder. The connecting rods are drop forged, I-beams, 11 in. in length. The piston pins are  $1\frac{1}{8}$  in. in diameter and have a bearing length of  $1\frac{3}{4}$  in. The lower bearing in the connecting rod is  $2\frac{3}{8}$  in. in diameter by  $1\frac{7}{8}$  in. in length. The crankshaft is a four bearing type,  $2\frac{3}{8}$  in. in diameter on all the main bearings. The bearing lengths are, respectively,  $2\frac{13}{32}$ ,  $1\frac{3}{4}$ ,  $1\frac{3}{4}$  and  $3\frac{1}{16}$  in., from front to rear.



Three-quarter rear view of Paige Six-66 chassis for 1921



Larchmont II sport model on new Paige Six-66 chassis



*Curves of brake horsepower, torque, etc., of new Continental engine employed in Paige Six-66 model for 1921*

Valve operation is through a helical timing gearset and a four bearing camshaft. The camshaft bearing diameters are, respectively, 2-5/16, 2-9/32, 2 1/4 and 2-7/32 in. The valves, which are on the right side of the engine, have nickel steel heads welded to 0.20 to 0.30 per cent carbon steel stems, the valve mechanism being fully inclosed and lubricated. The diameter of the valve head is 1-15/16 in. and the diameter of the opening 1-13/16 in. These are 45 deg. type valves, having a lift of 5/16 in.

The engine is oiled by combined pressure and splash system. The oil pump is a gear type externally mounted, providing pressure feed through the drilled crankshaft to the main bearings and connecting rod lower end bearings. A pressure lead also goes to the gearcase. The other parts of the engine are lubricated by the oil fog. The oil pressure adjustment is located on top of the crankcase at the front end and consists of an adjusting screw which is turned clockwise to increase the oil pressure and anti-clockwise to decrease it. The oil pressure should be approximately 15 lb. at 1000 r.p.m.

The water pump, generator, ignition distributor and fan pulley are all driven from an independent gear, which meshes with the timing gear train. This is located on the left side of the engine, the generator being mounted on a shelf at about the center of the engine and the water manifold entering the cylinder blocks between the second and third and fourth and fifth cylinders, thus giving two entering points and distributing the cooling fluid uniformly throughout the jackets. The thermostat is set in the water manifold at the point just before it enters the radiator tank and is arranged with a by-pass so that the water is by-passed without passing through the radiator until the engine warms up to the desired point.

The capacity of the cooling system is 5 3/4 gal. The radiator on this new car is of greater capacity than the previous designs, but is still of the V-type characteristic of late Paige cars. It is higher than in the previous model,

in order to match the redesigned body lines. The fan is a ball bearing type, four bladed, driven by a fan belt and provided with a quick adjustment.

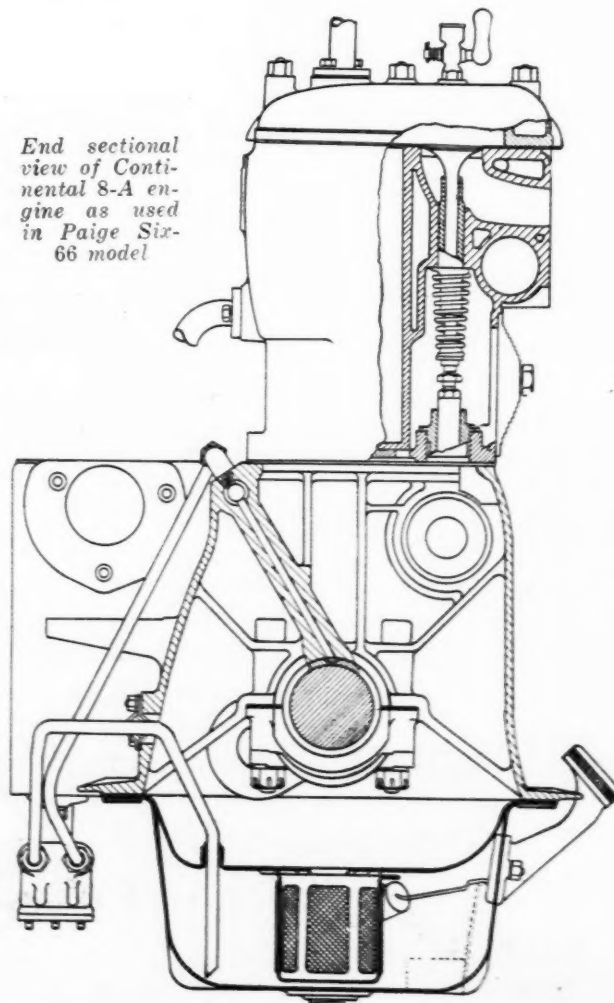
Lubrication is accomplished by a combination pressure feed and splash system in which the oil is forced to the crankshaft and connecting rod bearings through drilled leads in the crankshaft. The camshaft, timing gears and cylinders are lubricated by spray and splash. A feature of accessibility is the external location of the oil pump, which is mounted below the crankcase in such a way that it is not interfered with by dropping the pressed steel oil pan, but at the same time can be independently reached for adjustment or repairs.

The carburetor is a Rayfield water jacketed type fitted with hot air intake and connected to a hot-spot type intake manifold which is so arranged that the unvaporized gases are brought in contact with the lower face of the exhaust manifold to assist in vaporization.

The electrical equipment consists of Gray & Davis units for starting and lighting and Atwater Kent for ignition. The generator is mounted on the left side of the engine and is driven off the pump shaft by means of a flexible, adjustable coupling. The starting motor is on the left side of the engine, bolts against a flange on the crankcase and is equipped with Bendix drive. The ignition units, including the distributor and coil, are mounted on a post on the front end of the crankcase, the coil being immediately adjacent to the distributor to cut down electrical losses and providing an accessible location for inspection and adjustment.

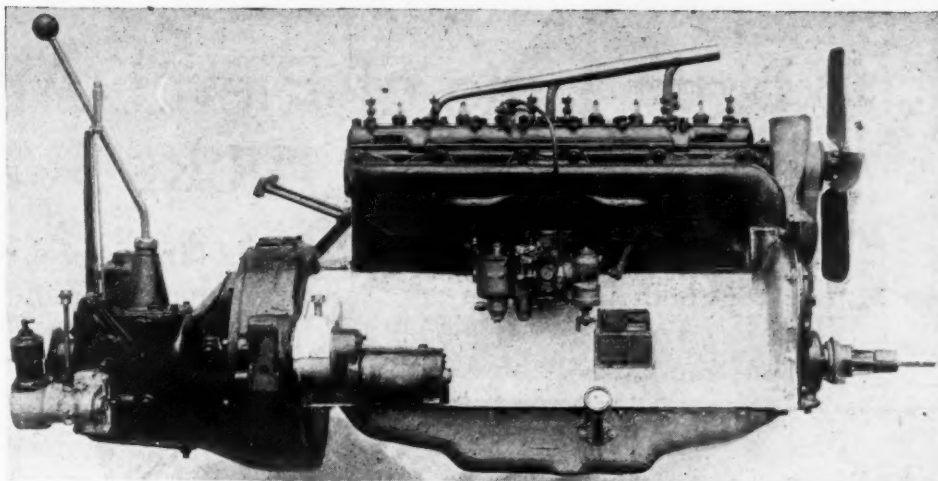
The clutch employed on this model is the same as on the previous Paige big six, being a Borg & Beck, 12 in., three

*End sectional view of Continental 8-A engine as used in Paige Six-66 model*





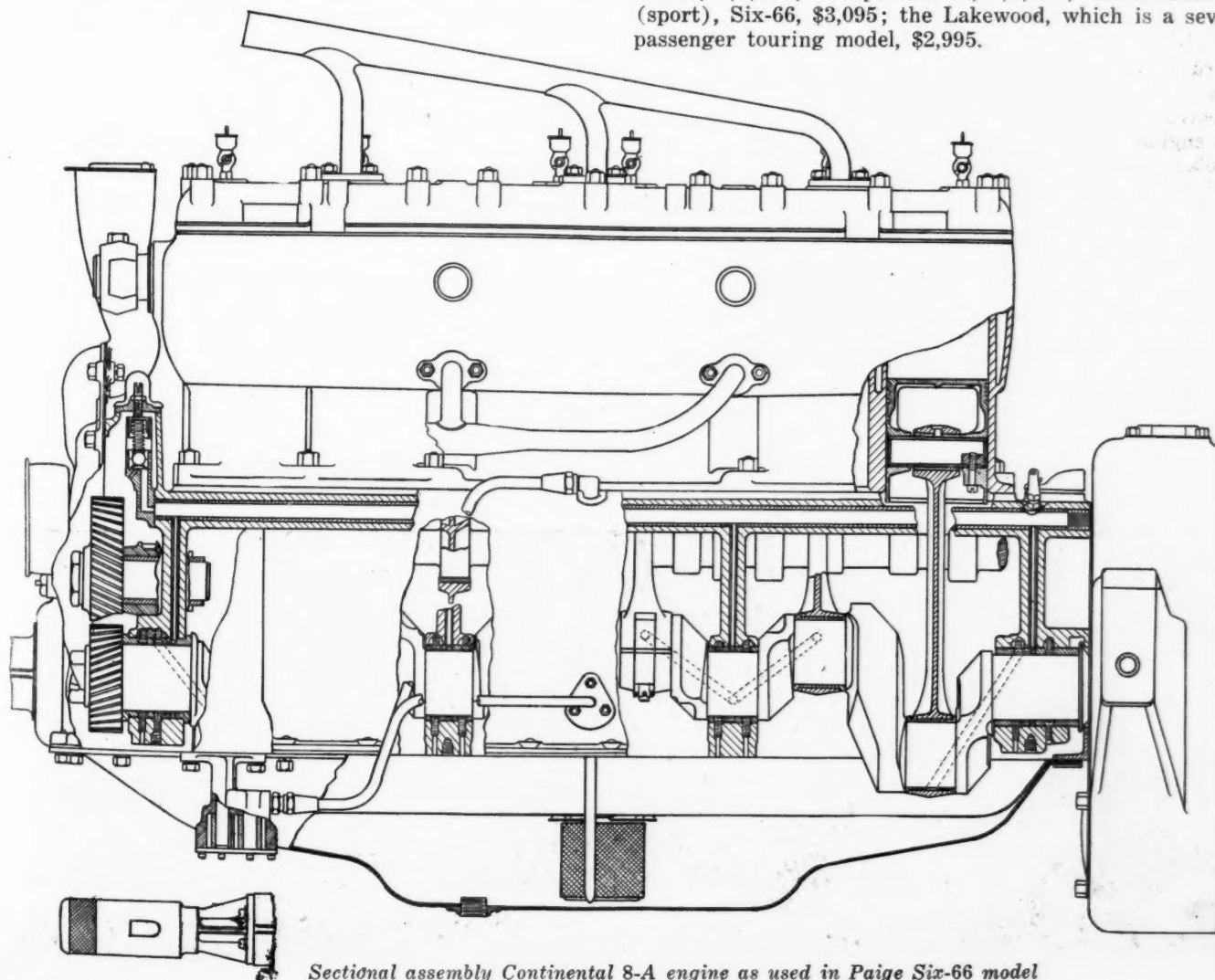
plate, dry type. The three-speed gears<sup>et</sup> is also similar to the former model, being a conventional three-speed and reverse type fitted with the Paige transmission lock, which is integral with the cover plate and equipped with a Yale lock. The propeller shaft on the new model differs from that of the preceding six in that it is a continuous member and no longer broken in two parts as in the former model which had a trunnion joint at this point. The new design has a tubular shaft with Spicer universals at each end. The rear axle is a floating Salisbury design with pressed steel housings, spiral bevel driving gears and differentials mounted on Timken bearings. The pinion shaft is mounted on Hyatt double row ball bearings and the rear wheels on double row ball bearings. The standard gear ratio is 4.55 to 1. This axle is used in connection with the Hotchkiss drive. The two sets of brakes are on the rear wheels, the drum diameter being 14 in. inside and 14-15/16 in. outside. The brake bands have 2 in. face width. The front axle is drop forged, I-beam section, heat treated, with Bock roller bearings for the front wheel spindles. The steering gear is a Jacox, adjustable type, with an 18 in. steering wheel.



*Right side of Paige Six-66 engine, showing carburetor mounting and manifolds*

The car has a turning radius of 22 ft. The fuel supply is carried in a 23 gal. gasoline tank at the rear protected by a rear cross-member. Feed to the carburetor is by Stewart vacuum system.

The body lines and exterior fittings are entirely new on this car. The windshield is equipped with side members, giving an upright post for good attachment of the side curtains. The prices on these cars are as follows: Sedan Six-66, \$3,995; Coupé Six-66, \$3,895; Larchmont II (sport), Six-66, \$3,095; the Lakewood, which is a seven-passenger touring model, \$2,995.



*Sectional assembly Continental 8-A engine as used in Paige Six-66 model*

# A New Line of Pierce-Arrow Motor Trucks

The step taken by this pioneer manufacturer is probably the most radical from both production and design standpoints in the history of the industry. An additional model and many changes in both engine and chassis are announced. Provisions for pneumatic tires are made by governor.

By P. M. Heldt

THE announcement of a line of motor trucks of completely new design is a relatively rare occurrence nowadays, for only a very small fraction of the several hundred truck manufacturers use their own engines and axles, and, moreover, in the truck market, novelty does not seem to be as big a factor as in the passenger car field. The expense and interference with production of a complete change in design are strong deterrents, and the result is that manufacturers of successful designs adhere to them as long as they reasonably can. Radical changes have been especially rare during the past several years, because the urgent demand for trucks discouraged them.

For the above reasons a good deal of interest attached to the announcement—made in AUTOMOTIVE INDUSTRIES of August 12—that the Pierce-Arrow Motor Car Co. had completely redesigned its two truck models and added a third of intermediate size. The Pierce company was one of the pioneer firms in the motor truck industry. An experimental truck model with chain drive and a passenger car engine was built by it as far back as 1905, and this particular truck was used by one of the big rubber concerns in developing the so-called wireless tire, but the model was never put in production, probably on account of pressure of the passenger car demand.

In 1910 the first worm-driven truck was built, the Pierce company pioneering this type of drive in the United States. This truck was subjected to a series of intensive try-outs, including a run to Pittsburgh with full load, and extended service in the Pittsburgh district. When it had proven itself capable of withstanding severe usage, it was put in production, and the first truck of the regular production series was sold to the Arbuckle Bros. Pittsburgh branch in July, 1911. The following year the 2-ton model was introduced, which was designed along the same lines

as the 5-ton, except that it had a sub-frame on which the engine and transmission were mounted, which was thought to be desirable on account of the higher speed of the smaller model.

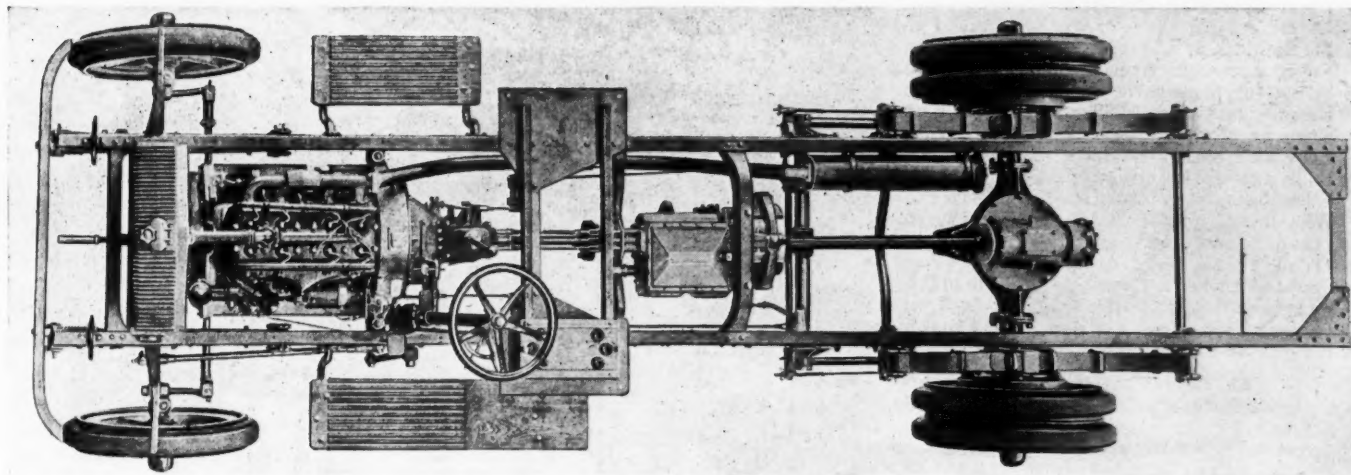
To judge by outward appearances, Pierce-Arrow trucks were not materially changed in design between 1911 and 1920. However, improvements were made all the time, and on eight occasions the changes were of sufficient importance to warrant the company in giving the truck a new model number. The original 5-ton design was known as the R-1 and the latest model previous to the introduction of the new design as the R-9. Similarly, the 2-ton model underwent three changes sufficiently important in character to warrant the adoption of a new model designation, the last model of the old type having been known as the X-4. The company purposely refrained from changing the general appearance of the trucks, and even the new designs look very similar to the old ones.

During the war, truck development was retarded somewhat, partly on account of the pressure of the demand from both military and commercial sources and partly because the British and French War Departments insisted that no changes should be made in the design of the trucks for which they had contracted, because it would interfere with replacements. While in the past the Pierce company has endeavored to keep up with progress in design by making changes in its models from time to time, a little over a year ago it was felt that the best plan would be to lay down entirely new designs. To-day the demands made of trucks are vastly different from what they were ten years ago. Then the motor truck was regarded as a piece of complicated machinery which had to be nursed and humored and kept on hard roads, if at all possible. Now a truck is expected to go anywhere, and a much better gen-



Pierce-Arrow 5-ton worm drive truck, Model R-10





Plan view of 5-ton chassis

eral performance is demanded. This not only calls for greater engine output, but also for a greater gear reduction, so that on low gear enough rear wheel torque can be obtained to slip the wheels on dry hard pavements. The changing demand is illustrated by the fact that whereas the original 5-ton truck had standard gear ratios of 7.8 for the high and 29.5 for the low gear, the latest model of the original 5-ton series, the R-9, had a high gear reduction ratio of 9.75 and a low gear ratio of 43.88.

At the same time that the gear ratios were thus increased, it was necessary to strengthen all of the transmission parts to take care of the increased torque. In practically all trucks with shaft drive, the weakest members in the transmission are the rear axle shafts, and these were brought up to practically twice their strength by a change in material, by the use of the proper heat treatment for the new material and by upsetting the ends where the splines are milled, so that the shaft diameter at the bottom of the splines equals the shaft diameter of the smooth portion between the splined ends. A similar development was carried through with the 2-ton truck.

It was also found that the engines of the earlier models were operating at rather too high compression. The compression volume used gave the best results on the testing stand, yielding a high output and a very satisfactory fuel economy, and while the engines ran well on the road as long as they were in a good condition, they would not run very smoothly after the combustion chamber walls had become covered with carbon and the bearings had become a little loosened. It is quite possible, also, that the change in the grade of fuel between 1910 and 1918 had something to do with making the original compression ratios rather high. In the R-9 engine, already, a lower compression was used, and as a result the output was reduced from 55 h.p. at 1200 r.p.m. to 50-51 h.p. at 1175 r.p.m., but the engine ran smoother under the lower compression. As regards fuel economy, while the high compression engine showed a higher efficiency on the testing stand, in every day operation there was no appreciable loss due to lowering the compression.

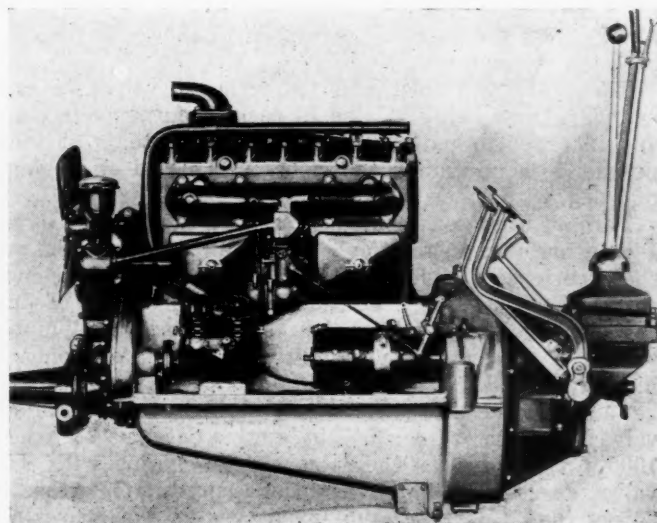
Reference has already been made to the demand for more power in modern trucks, as compared with trucks of the same load capacity ten years ago. During the past two years the Pierce-Arrow Motor Car Co. developed its dual valve engine for passenger cars, and the results obtained with this engine indicated one way of increasing the power output without increasing the weight of the truck engines. Other features besides increased power which it was desired to incorporate in the truck were the block cylinder construction, detachable heads and inclosed valves. It was also desired to provide the engine crank-

case with continuous webs so as to eliminate the dust pan and to substitute a dry disk clutch for the cone clutch formerly used, which latter needed occasional oiling and in some cases did not get it. Then, it was desired to redesign the transmission in order to get greater low gear reductions and at the same time provide four changes of speed for all models. It was also desired to adopt left steering and center control, because the public seemed to be biased in favor of this construction (notwithstanding the fact that in truck work right-hand steering has some important advantages) and because the centrally located control lever makes the control linkage much simpler.

The above covers some of the major changes which it was desired to make, and which really necessitated a complete new design from the ground up. In addition to these, there were, of course, hundreds of minor changes which it was found expedient to incorporate in the new design, and there are hardly any of the parts of the old trucks which are interchangeable with the corresponding parts of the new ones.

In order to complete or at least extend the line of trucks, a new intermediate model, of 3½ tons capacity, to be designated by the type letter W, has been added. The original model of this capacity was built 5 years ago and carried the model designation W-1, and the new model is known as the W-2.

The chief specifications of the three models are as follows:



Inlet side of engine

**2-TON MODEL—X-5**

Cylinder bore .....4 in.  
 Stroke .....5½ in.  
 Speed for solid tires.....1400 r.p.m.  
 Speed for pneumatic tires....1600 r.p.m.  
 Engine output at 1400 r.p.m.....43 hp.  
 Transmission low gear ratio.....5.2  
 Rear axle ratio, standard.....8 1/3  
 Rear axle ratio, option.....9 2/3  
 Wheelbase, standard.....150 in.  
 Wheelbase, long.....180 in.  
 Tread, front.....58¼ in.  
 Tread, rear.....61 in.  
 Speed with solid tires.....18 m.p.h.  
 Speed with pneumatic tires (40 x 8 in.  
 rear; 36 x 6 in. front).....24 m.p.h.  
 Weight of truck chassis, dry....6200 lb.

**3½-TON MODEL—W-2**

Cylinder bore .....4½ in.  
 Stroke .....6¾ in.  
 Governed speed for solid tires.1200 r.p.m.  
 Engine output at 1200 r.p.m.....63 hp.  
 Transmission low gear ratio.....6.12  
 Rear axle ratio .....8  
 Wheelbase, standard .....162 in.  
 Wheelbase, long .....198 in.  
 Tread, front .....68-11/16 in.  
 Tread, rear .....65-9/16 in.  
 Speed with solid tires .....16 m.p.h.  
 Speed with pneumatic tires (44 x 10  
 in. rear; 38 x 7 in. front)....22 m.p.h.  
 Total weight of chassis, dry....8100 lb.

**5-TON TRUCK—R-10**

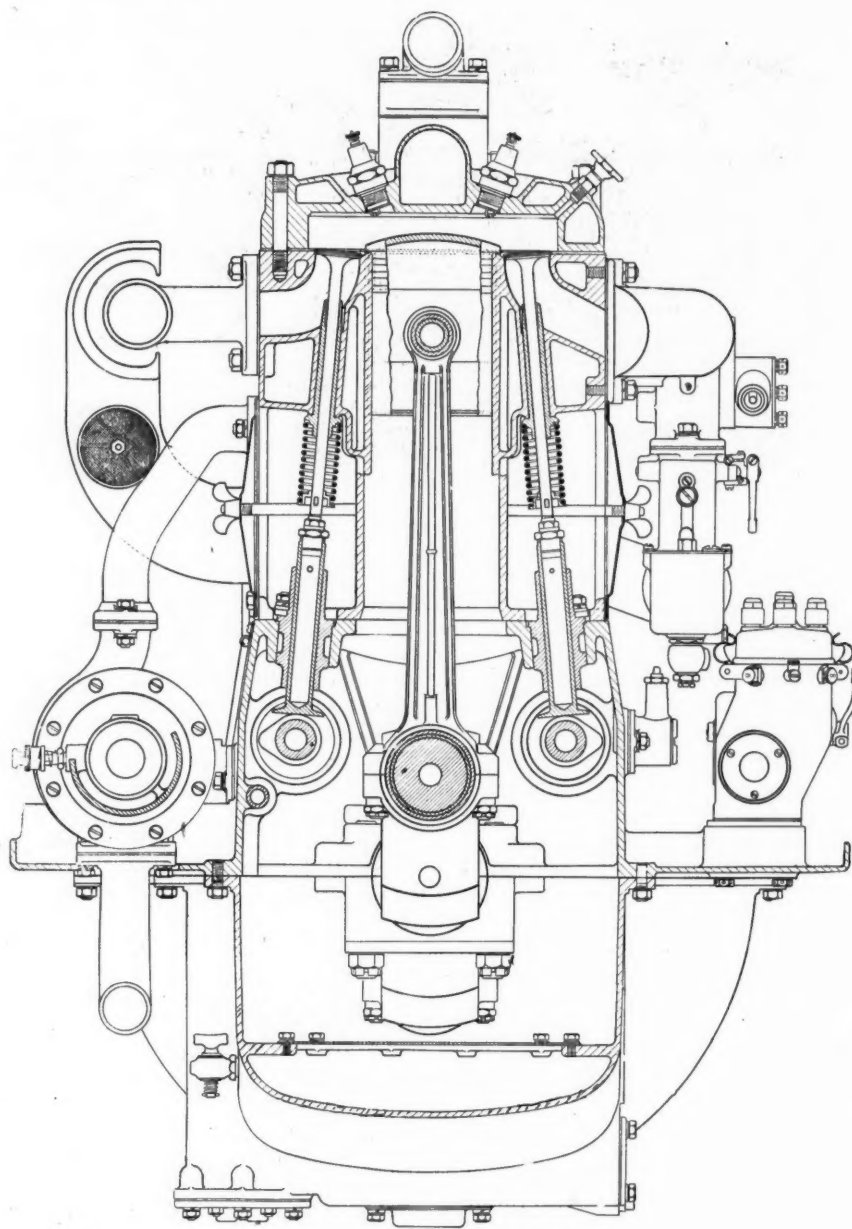
Cylinder bore .....4½ in.  
 Stroke .....6¾ in.  
 Governor speed .....1200 r.p.m.  
 Engine output at 1200 r.p.m.....63 hp.  
 Transmission low gear ratio .....6.12  
 Rear axle ratio .....10 to 1  
 Wheelbase, standard .....168 in.  
 Wheelbase, long .....204 in.  
 Tread, front .....68-11/16 in.  
 Tread, rear .....66¾ in.  
 Total weight of chassis, dry....9100 lb.

It will be seen from the above specifications that the engine is built in two sizes, the large one serving for both the 3½-ton and 5-ton models and the smaller one for the 2-ton model. We will here describe the large one, but, except where dimensions are given, the description also applies to the smaller engine, the two being designed on very similar lines.

The cylinders are cast in a single block, with the cylinder heads forming a separate casting. The compression chambers are formed in the cylinder head casting and are completely machined, which not only insures uniform compression in all cylinders, but also reduces the tendency of carbon to adhere to the compression chamber walls.

There are two inlet and two exhaust valves in each cylinder, these being located in pockets on opposite sides, and in order to reduce the volumetric contents of these pockets to a minimum, the valves are placed at an angle of 7 deg. with the vertical.

Perhaps the most important factor in the decision of the Pierce-Arrow company to get out a new line of trucks was the experience they had had with the dual-valve passenger car engines. It might be thought that the effect of dual valves on the volumetric efficiency, and consequently on the output of the engine, would become appreciable only at high speeds, but the horsepower curves show this to be an erroneous impression. For instance, the single valve Pierce-Arrow 4 x 5½ in. engine develops 28 h.p. at 1000 r.p.m., whereas the same size of engine with dual valves develops 35 h.p. at the same speed, an increase of 25 per cent. However, the advantages of dual valves are not limited to the increase in power output, for a marked

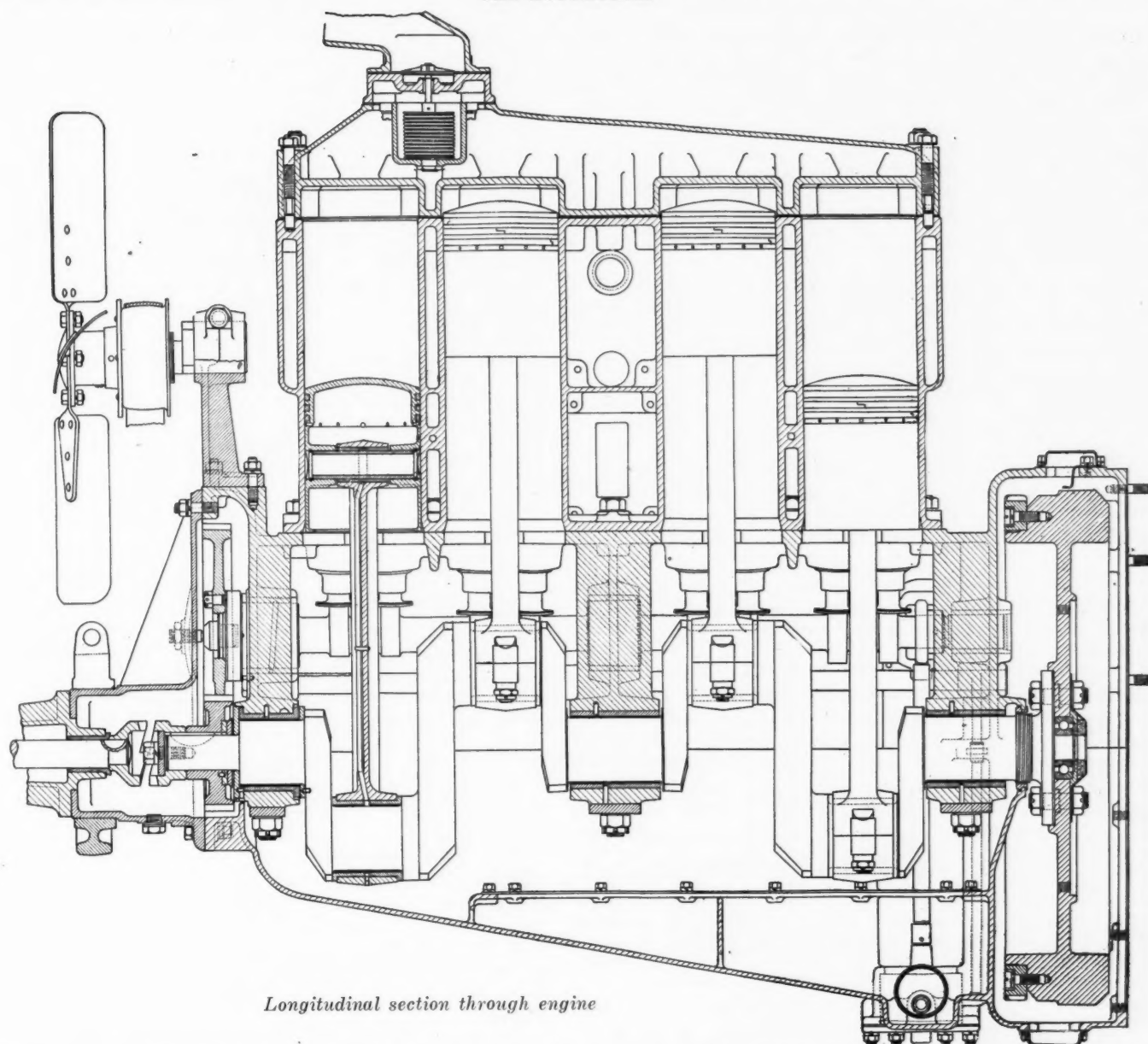


Cross-section through engine

improvement in fuel economy is also obtained. This is explained on the ground that with dual valves the dead gases are more completely expelled from the cylinders, hence there is a smaller admixture of dead gases with the fresh charge and the charge need not be made so rich in order to be inflammable. The first dual valve truck engine built was of 4 x 5½ in. cylinder dimensions, the size used on the 2-ton truck. This, on the testing stand, showed the remarkably low fuel consumption of 0.52 lb. per brake h.p. hr., at 1400 r.p.m., at which speed an output of 49 h.p. was delivered. The much greater output shown by this engine as compared with a single valve engine of equal size, and its improved fuel economy, decided the company to design dual valve truck engines and to put them in production as soon as conditions permitted.

Owing to the use of a long intermediate bearing on the crankshaft, there is a wide space between cylinders Nos. 2 and 3. The upper portion of this space is incorporated in the water jacket, while the lower portion is used for carrying the hot air from the exhaust heater across to the carburetor. An extension of the exhaust air heater and the carburetor air inlet are bolted up against the sides of the engine over this passage. The roof of the compression



*Longitudinal section through engine*

chamber is absolutely flat, which facilitates the machining operation (milling) on same.

In developing the dual valve engine, tests were made with different compression volumes, from 19.2 to 27 per cent. of the total volume, and while somewhat better fuel economy was obtained with the higher compression ratios, the conclusion was reached that a compression volume of 23.3 per cent. was best suited to road conditions and was consequently adopted.

The Guider piston is used, which is an invention of the Pierce-Arrow factory superintendent. This is a cast-iron piston with three expansion rings at the upper end and a slightly domed head, but no ribs between head and piston bosses. The special feature consists in cutting two parallel circumferential saw slots in the piston skirts on the bearing sides opposite the piston pin, about an inch apart, and peening the narrow strips of metal between them from the inside, so they will bulge out slightly. This permits of a slightly greater clearance being given the piston without danger of piston slap when the engine is cold, and obviates the risk of the pistons seizing when the engine works hard.

The piston pins are of the floating type, being held against drifting in the piston bosses by means of snap rings at both ends. The pistons are turned with an oil groove at the bottom of the lowest ring groove, and a number of drill holes are provided through which the oil col-

lecting in this groove can return to the crankchamber.

There is nothing unusual in the connecting rod, which is of I section, and has an oil tube secured to it through which oil is forced from the crankpin to the piston pin bearing.

The crankshaft is of the three bearing type, and is particularly robust, all bearings being  $2\frac{1}{2}$  in. in diameter. End thrust in both directions is taken up on the forward bearing. The crankcase is of aluminum and is split in a horizontal plane through the crank axis. The flywheel bell housing is cast integral with the crankcase, one-half with each half of the crankcase. The crankcase castings also include the whole of the timing gear housing except the cover plate.

Until now the Pierce-Arrow company has used roller type cam followers, but in the new design of engine it was found possible to obtain just as good results, from the standpoint of quietness, with the mushroom type, and this was consequently adopted. The cam flanks are given a rather small radius of curvature, so as to keep down the rate of acceleration when the flank first contacts with the follower. Valve spring housings are cast on the cylinder block and are closed by two pressed steel cover plates on each side. These are held on by wing nuts for easy removal.

The starting crank is supported in an extension of the

timing cover plate, this having been found much preferable to supporting it on the front cross member of the frame, owing to the fact that in a heavy motor truck the frame always distorts in service and the crank will then be out of line with the ratchet on the end of the crankshaft. Attention may be called to the heavy ribbing of the upper half of the crankcase, which part, of course, takes all the strain due to the explosion and inertia forces. Steel plates are used under the caps of the main bearings so as to prevent the metal crushing under the pressure of the nuts on the studs.

There are naturally two camshafts, and each is driven directly from the crankshaft by helical spur gears without intermediate gears. Each of the camshaft gears in turn drives an accessory driving gear, the one on the exhaust side being for the water pump and generator and the one on the inlet side for the ignition unit. On the inlet camshaft gear is carried the governor which controls the speed of the engine.

The fuel is carried in a cylindrical tank under the driver's seat, with a capacity of 25 gal. For feeding the fuel a pressure system has been adopted, for the reason that with the present grade of fuel it is expedient to place the carburetor as close to the inlet valves as possible, which means high up on the engine, and, besides, motor trucks are now required to ascend very steep grades, hence gravity feed could not be depended upon under all conditions.

Until now the Pierce-Arrow Motor Car Co. has always used its own design of carburetor, but for the new line of trucks the Stromberg carburetor has been adopted, certain features of construction having been changed in accordance with Pierce-Arrow practice. For starting, air pressure can be pumped up in the fuel tank by a hand pump mounted on the dash, and for regular operation there is a plunger air pump at the side of the engine, operated from the inlet camshaft. In addition to the throttle valve in the carburetor, which is hand or foot operated, there is another throttle valve in the inlet manifold upon which the mechanical governor acts. The inlet manifold is an aluminum casting and is provided with a water

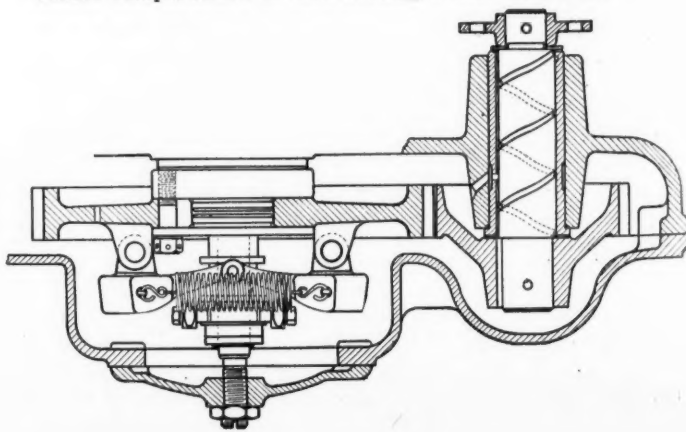
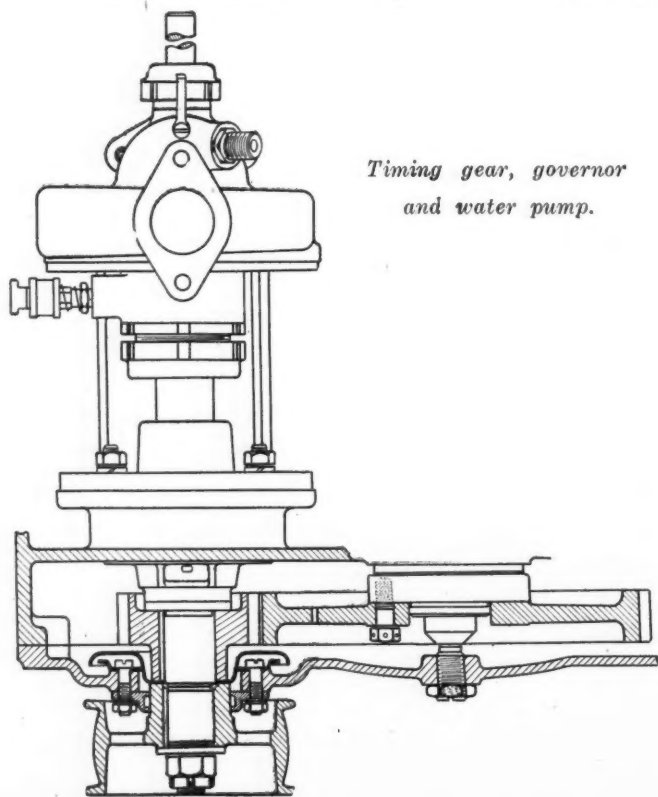
jacket extending practically the whole length of the horizontal portion. This casting has inlet passages for the water cored in it, which register with core holes in the engine jacket when the manifold is in place, while the outlet from the manifold jacket is through a brass pipe which connects to the suction side of the circulation pump.

Hot air is taken through an air heater on the exhaust manifold. Directly below the hot air muff, on the passage to the carburetor, there are two gauze covered openings for cold air, which can be shut off more or less as rendered desirable by the atmospheric temperature.

The ignition system used is the Delco 2 point system, also known as the dual spark system, the ignition unit being located forward on the inlet side of the engine. There are two sets of spark plugs in the cylinder heads, both arranged at an angle to the vertical and substantially so located that the distance from one pair of spark points to the remotest part of the compression chamber is a minimum. The spark plug cables are neatly carried in metal tubes. The ignition system differs from the dual spark system fitted to Pierce passenger cars in that no automatic advance is provided, which is not considered necessary on these moderate speed engines.

Current for the ignition system is furnished by a Delco generator, charging a Willard storage battery of the threaded rubber separator type. Electric lights are standard equipment, and the generator and batteries also furnish current for these. The generator is of sufficient capacity to also supply current for electric starting, but a starter is not furnished as regular equipment. If a starter is desired, a battery of larger capacity is provided. The engine bell housing is completely machined ready to receive the starter, and the flywheel is machined to receive a starter gear ring. The generator is of Delco make, with third brush regulation, and if a starter is furnished it is also a Delco. Since the trucks are regularly equipped with a generator and battery, the installation of the starter does not involve any great expense. All wiring on the chassis is carried in copper tubes and is practically proof against mechanical injury and damage by moisture. Junction boxes are placed near the consuming devices on the frame, from which short flexible cables with snap connections in the junction box lead to the consuming devices (lamps).

Cooling is effected by means of a tubular radiator with cast upper and lower tanks and side spacers. Cooling fins are cast on the upper tank, while the lower tank is plain. The water is circulated by means of a centrifugal pump, and air is drawn through the radiator by a four bladed 19 in. fan mounted on a bracket bolted to the top of the timing gear housing and driven by a flat belt from a pulley on a forward extension of the pump shaft. The belt tension can be adjusted by means of the usual eccentric. A thermostat of the Sylphon type is mounted in the water outlet on top of the cylinder block and serves to keep the outlet temperature of the cooling water constant.





Lubrication of the engine is by pressure feed throughout. The gear type of oil pump is mounted in the lower half of the crankcase at the rear end, being driven from the exhaust camshaft through a pair of helical gears and a vertical shaft. A vertical rib cast on the rear wall of the lower half of the crankcase is drilled for an oil passage, and this passage when the halves are bolted together registers with a corresponding passage in the upper half of the case. The vertical passage in the upper half delivers into a copper tube cast in place which forms the horizontal distributing member of the pressure lubricating system, distributing passages being drilled from the bearing hubs out to the main distributor tube. Lubrication of the camshaft bearings is also by pressure feed, through the hollow camshafts. The oil pump driving gear is carried in brackets on a plate set into the upper half of the crankcase from the side. The oil filler and breather is mounted on top of the governor housing. This is an innovation, and has been found very desirable, for the reason that the governor chamber seems to act as a condenser of moisture and consequently tends to become rusty very quickly, which greatly interferes with the sensitivity of the governor. A lead from the oil distribution system runs to the pressure gage on the dash, and there is also a connection to the pressure relief valve.

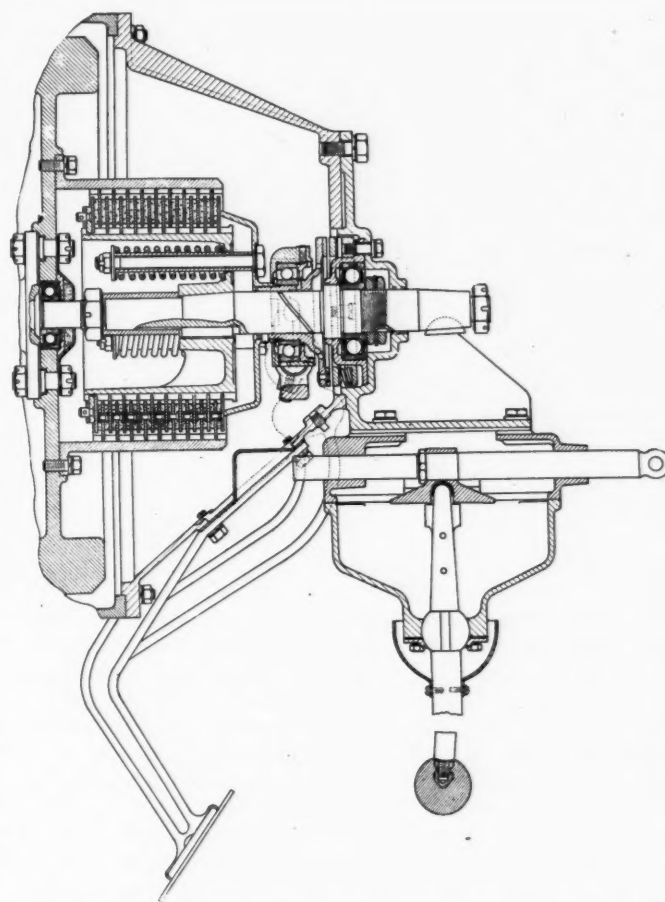
The oil pressure is altered by two valves on the oil regulator. First the needle valve is opened up, which is the high speed adjustment. Then, with the engine throttled down to its lowest running speed, the low pressure setting is obtained by adjusting the large regulating valve. When adjustment has been effected, the lock nut is set, holding the valve in place. To make the high speed adjustment, it is necessary to adjust the needle valve by screwing down on same until the desired pressure is obtained, then setting the lock nut to hold the valve in place. There is a small relief valve under the high-speed needle, made of spun brass, and arranged to restrict the full opening of the high-speed valve. In this way considerable flow of oil past the high-speed valve is permitted when the oil is cold, and the pressure gage is thus protected from damage.

The engine is designed for three point support, two supporting arms being cast on the bell housing and the third support being a trunnion at the front end. In former Pierce-Arrow truck engines a front trunnion support was also used, but this trunnion was located above the crankshaft axis. In the new engine the trunnion has been made concentric with the crankshaft axis and of more liberal size. Moreover, the bearing for the trunnion is provided with a lug on top which is split and clamped together, and a laminated shim is placed between the two halves of the lug, which permits of very close adjustment. The front engine bearer is bolted to a frame bracket on each side by a single transverse bolt.

The supporting arms on the bell housing rest on brackets secured to the frame side members, and bolts are passed through the arms and the frame brackets, with heavy coiled springs under the nuts. This gives a very flexible support for the engine which fully takes care of any "weaving" of the frame.

A dry disk type of clutch is now used, instead of the former cone clutch, and is completely inclosed. The steel disks are lined with Raybestos molded rings. Between the clutch and the transmission is incorporated a short shaft with Thermoid fabric universal joints.

The transmission case is moved farther back than in previous models, in which it was under the floor boards of the driver's seat. The object of this change is to reduce the length of the propeller shaft and eliminate the need for an auxiliary bearing on same. This location of the transmission also facilitates the arrangement of the



*Dry disk clutch and gear shift lever mounting.*

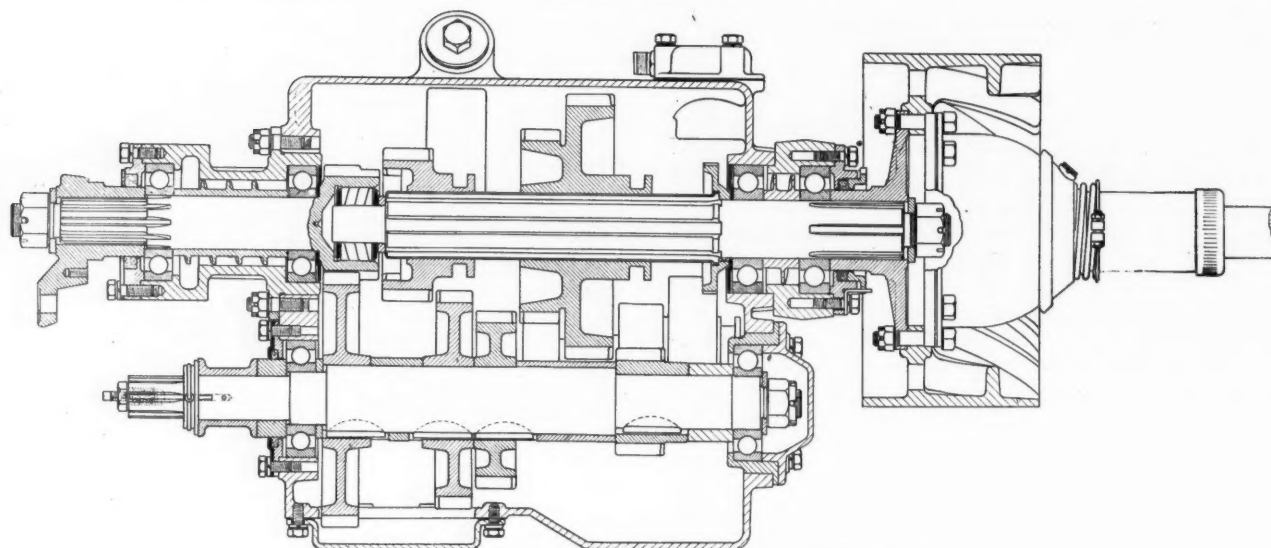
power take-off. As already pointed out, the transmission is a 4-speed selective sliding type, and its shafts are mounted on ball bearings throughout, except that the pilot bearing for the primary shaft is a roller bearing.

While in the 2-ton transmission the secondary shaft is located directly below the primary shaft, in the larger transmission it is located below and to one side of the latter. The secondary shaft is made to protrude at the forward end of the transmission housing, to take a power take-off, and there is a hand hole at the side of the housing over which either a power take-off or a tire pump can be bolted.

All gears are of oil hardened steel. The sliding rods are mounted on top and connect by short links to the control mechanism which is incorporated with the flywheel and clutch housing. A ball handle control lever is used with a lock-out latch for the reverse.

Whereas in the 2-ton model both brakes are now located on the rear wheels, in the 3½ and 5-ton models the transmission brake is continued. A noteworthy feature of this brake is that it is supported directly by the transmission housing, instead of by a frame cross member, and must therefore remain concentric with the brake drum. The gear case is of cast iron and therefore of sufficient strength. This brake is of very liberal size (12 in. diameter, 6 in. wide) and is unusually powerful. The brake drum, which is bolted to a flange mounted on the end of the transmission tail shaft, is cast with helical flanges on the inside of its rim, which are intended to promote air circulation and thus keep the braking surface cool. The transmission brake is of the block type and is operated by a pedal.

The front and rear axles of the 2-ton model are Eaton Axle Co. products, and the propeller shafts and universal joints for all models are of Spicer make.



Section through transmission and transmission brake.

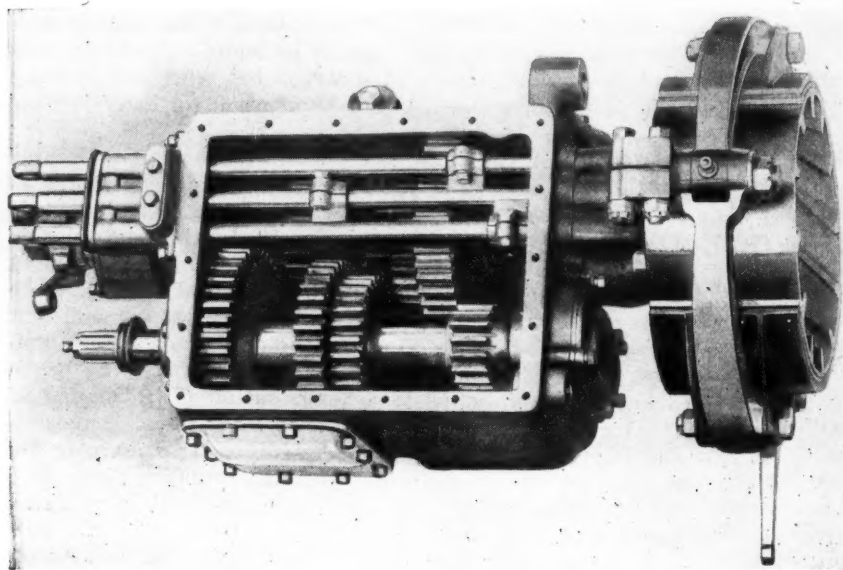
The rear axles have been redesigned, but they very much resemble the former Pierce-Arrow axles, being of the worm drive, cast steel housing type. The new design of worm gear developed by David Brown & Sons of Huddersfield, England, has been adopted. The advantage claimed for this is that it gives a greater area of tooth contact for a worm and wheel of given outside dimensions and therefore has a greater transmission capacity. The difference in principle, as compared with the former David Brown worm gear, is as follows: A longitudinal section of the former type of worm (the same as any other driving worm heretofore used) shows straight tooth flanks, while a transverse section of the wheel shows tooth flanks of involute form. In the new David Brown worm gear this relation has been reversed, the tooth section of the wheel now having straight flanks while the tooth section of the worm is a conjugate of the wheel tooth form.

The 2-ton rear axle is a semi-floating axle and is fitted with Bock roller bearings on the worm and worm wheel shafts, whereas the  $3\frac{1}{2}$  and 5-ton rear axle is mounted on ball bearings at the center with a large S.K.F. ball thrust bearing for taking up the end thrust due to the worm. The  $3\frac{1}{2}$  and 5-ton axles are of the full floating type and Timken roller bearings are used in the wheels.

Cast steel hollow spoke wheels have been substituted for the wooden wheels formerly used, chiefly on account of the scarcity of wood suitable for wheel material.

The rear wheel brakes are of the internal expanding type, and are operated by means of a hand lever. An ingenious equalizer is used for the brake mechanism. The equalizing lever is formed with ball ends which extend into the bores of the brake shaft lever eyes. These eyes are bored out from the inner end, and the holes are blind. The hub of the equalizing lever is bored out to a comparatively large diameter and the brake rod extends through it and through a semi-cylindrical washer at the back of this hub, which is backed up by a wing nut with locking wedges which engage into wedge shaped notches on the back face of the washer. The washer is located in a correspondingly shaped depression at the rear of the equalizing lever and forms the pivot around which the lever turns. On the forward side of the hub is a disk washer which is pressed against the hub by a coiled spring on the brake rod.

The frames are made of heat treated pressed steel channel sections, of the following dimensions for the different sizes: 2 ton,  $6 \times 2\frac{1}{2} \times 5/16$  in.;  $3\frac{1}{2}$  ton,  $7 \times 2\frac{1}{2} \times 5/16$  in.; 5 ton,  $8 \times 2\frac{1}{2} \times 5/16$  in. The side members are straight at the rear end, while at the forward end they taper on the under side. There are four pressed steel cross members, a light one in front of the radiator, another under the driver's seat, another at the rear end of the transmission and one at the extreme rear of the frame. The largest and heaviest cross member is located under the driver's seat, and is provided with gusset plates projecting from the frame side and serving as support for the gasoline tank and batteries, as well as the driver's seat box. These gusset plates, being located at the center of the chassis, prevent misalignment of the side members and at the same time permit proper frame flexure, allowing the truck to accommodate itself to road inequalities. At the forward extremity of the frame there are combination brackets for the front springs and the bumper, which latter is spring-backed. Oak sills are clipped to the frame back of the driver's seat, to facilitate attaching the body and to obviate the necessity for drilling any holes which would



Transmission and brake. Note double provision for power take-off.

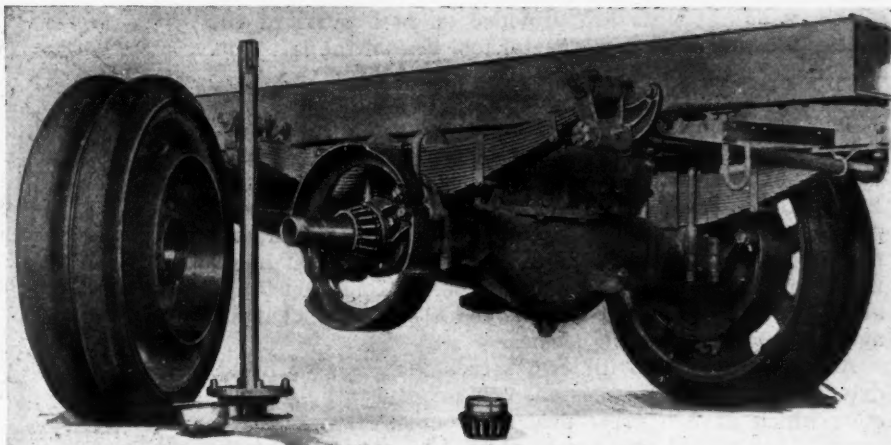


weaken side members. The sills are not intended to brace or strengthen frame.

In the 2-ton truck, in which the torque reaction is of moderate value, the Pierce engineers have adopted the Hotchkiss drive, but in the 3½-ton and 5-ton trucks they adhere to the use of radius rods and torque bar. Much larger bearing surfaces are now provided on the pin at the rear end of the torque bar, and the bearings for the pin are provided with bearing caps so they can be adjusted when required. The forward end of the radius rods are mounted on a cross tube, and in order to prevent wear on this cross tube, a split steel sleeve is placed over it, while a split bronze bushing is fitted into the end of the radius rod, and all wear comes on these easily replaceable members. The forward end of the torque rod is supported by a ball and socket carrier. The radius rods, instead of having ball and socket joints at both ends, are now made with a large eye at the forward end, which passes over the end of the front tube, while a ball and socket joint is retained at the rear end.

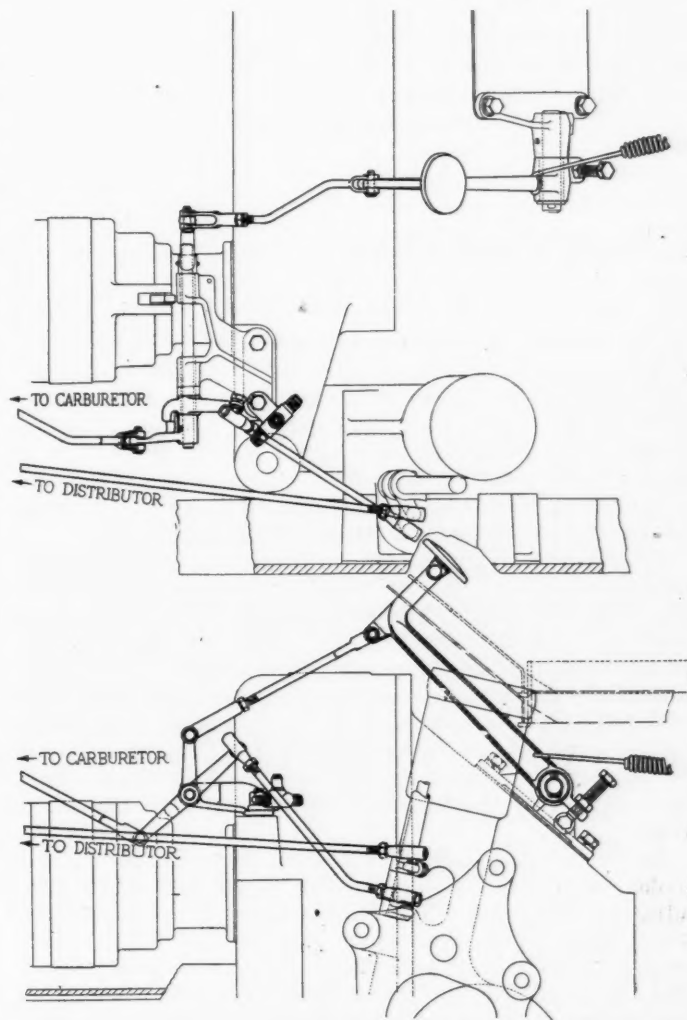
The steering gear is of the semi-reversible screw and nut type, and is now located on the left-hand side. The steering column is slightly inclined and is braced to the dash by a triangular bracket. A 20-in. steering wheel is used, with wood rim and malleable iron spider. The steering arm is a steel drop forging, heat treated, and is held on to the tapered square end of the spindle protruding from the steering gear housing by means of a nut with cotter pin. The drag link is fitted with hardened steel ball sockets and is provided with springs to take up wear and reduce road shocks on the steering mechanism. The front axle design is substantially the same as on previous Pierce-Arrow trucks.

The trucks are regularly fitted with lazy back seats with comfortable cushions, the seats easily accommodating two passengers besides the driver. A cab top with glass windshield is furnished as extra equipment. In the rear of the cab there is a roll curtain with celluloid window, and at the sides there are two hinged, steel frame, canvas-covered half doors. Roll side curtains with celluloid windows are also provided. The windshield is supported at the top, from the cab. It is in three sections, the right-hand section and the lower left-hand section being fixed, whereas the upper left-hand section is adjustable and can be swung forward for a rain vision effect and back to permit of free circulation of air through the cab. Oak floor

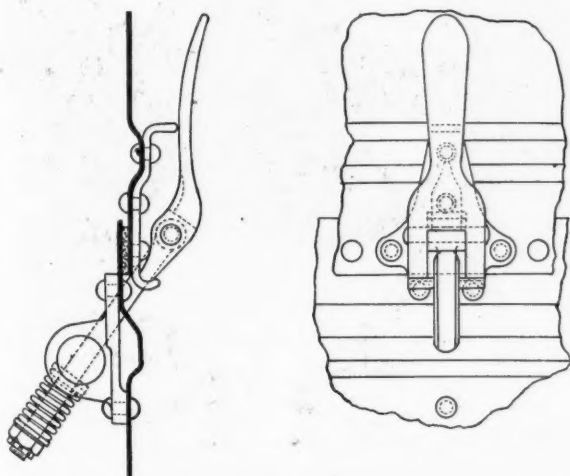


Rear axle and brake layout of the 5-ton truck

boards are provided, reinforced by metal strips below. The toe board is of pressed steel. An instrument panel is mounted in the upper left corner of the pressed steel, cowled dash. This panel carries the following instruments: Oil gage, hand air pump, carburetor choke, dash light, ammeter, combination ignition and lighting switch and fuse box. The ignition switch is so arranged that the engine can be run on either one set of plugs or the other, or on both together. This is convenient for locating faults in the ignition system and is also very effective.



Arrangement of control linkage



Spring retainer for engine bonnet

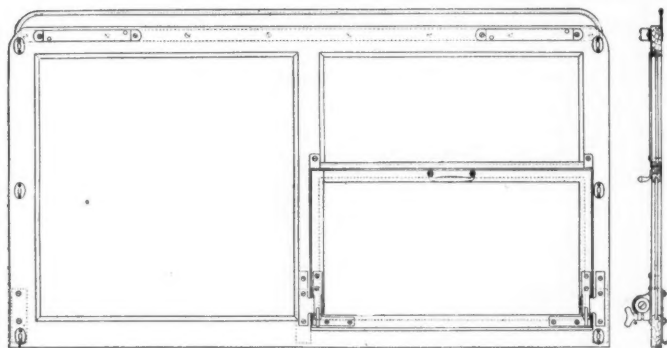
tive in demonstrating the advantages of the dual ignition.

Oak runningboards are provided on both sides of the truck, and there is a large metal tool box on the left side. The runningboards form the rear support for the front fenders. Heavy forged fender brackets are used.

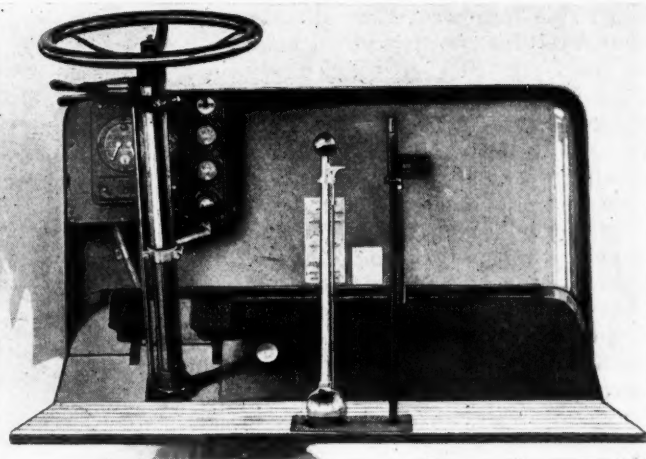
The front springs are half elliptic, and of the banded type, 41 in. long by 3 in. wide. The rear springs are also half elliptic, of the banded type, 56 in. long by 3½ in. wide. Both sets of springs are fitted with auxiliary rebound top plates. In the eyes of the rear springs, which are mounted on cross rods, there are two short steel bushings, which obviate wear on the rod. Bronze bushings are fitted in the shackles, and the shackle pins are clamped against rotation in the shackles.

A dash odometer with trip attachment is now fitted, driven from the transmission, instead of the hub odometer, which gave a great deal of trouble. Owing to its exposed position it was easily injured by striking objects and the figures were generally very difficult to read, owing to condensed moisture or dirt on the glass.

In addition to the three truck sizes the Pierce-Arrow



Showing the three sections of the windshield; the upper left-hand section is adjustable



Cowled dash with instrument panel

company will manufacture a road tractor chassis. This comprises the larger of the two truck engines on a 7-in. frame with a 132-in. wheelbase. A 5-ton rear axle is put under this frame, with a 10 to 1 reduction ratio and with 36-in. wheels. This tractor is designed to haul semi-trailers and to meet miscellaneous trailer requirements.

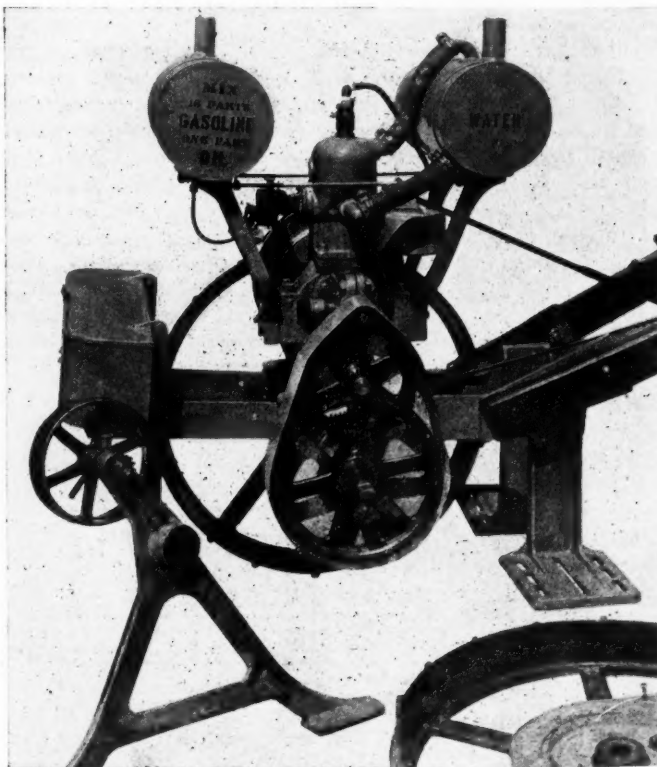
**T**HE principal vanadium mine in the world is found in Peru, and is known as Minas Ragra, which lies on the eastern slope of the western cordillera of the Andes, in a westerly direction not far from Cerro de Pasco. The approximate production of vanadium was 3000 metric tons in 1912. There was no production in 1913. It increased from 100 in 1914 to 3100 in 1915, 3350 in 1916, 4000 in 1917, and decreased to 2200 in 1918.

## Power Cultivator for Garden and Small Farm

**B**Y utilizing the full tractive power of a 2 hp. water-cooled one-cylinder engine, the garden cultivator shown is said to operate readily to a depth of 4 or 5 in. even in hard baked soil. The handles, adjustable to the height of either a man or a boy, have the spark control on the right and the clutch lever on the left. The model is known as the Merry Garden Auto Cultivator, and is manufactured by the Atlantic Machine & Mfg. Co.

No batteries are used, ignition being by a high-tension magneto built into the fly wheel of the engine, which is especially designed by the Erinrude Motor Co. The bore is 2⅝ in. and the stroke 2½ in. The machine operates at an average speed of 2 m.p.h. Circulation of the cooling water is by thermosiphon action, the tank having a capacity of 2 gal. Fuel is carried in a 1½ gal. tank. For lubrication, a mixture is used consisting of 1 gal. of fuel with ½ pt. of cylinder oil. On account of the narrowness and light weight of the cultivator, a differential is dispensed with.

By removing the left tractor wheel, the power frame and pulley shown at the left of the figure can be readily adjusted, the hole in the frame fitting over the tractor wheel axle. The small spur gear on the pulley shaft meshes with the large gear of the tractor to take off power. The usual cultivating implements are provided, and a lawnmower designed especially for the machine can be had as an extra attachment.



The Merry Garden Auto Cultivator with the tractor wheel off for substituting the power frame shown at the left



# Multiple Jet Carbureter Has Gravity Flow Through Jets

This carbureter has a passage around each jet which is filled with fuel when that jet is not in action. This construction provides a puddle of fuel which is first drained and after that acts as a miniature carbureter. A poppet valve held shut by a spring provides an adjustment for economy.

**T**HIS is a multiple jet expanding carbureter of the barrel throttle type, and is known as the Miller type H. Four to six main jet tubes are used, depending on the size of the carbureter, and these tubes, having each the fuel jet in the bottom and four small air holes a little above, are placed in a row in a removable magazine. This magazine has a fuel passage which supplies the jet in the bottom of the tubes and provides an air jacket, which surrounds the main portion of each tube; these jacket spaces have a passageway near the top of the magazine above the float level that connects them with each other and with the outside air. When not in action the tubes and surrounding air jacket spaces are filled with fuel, which provides a succession of puddles as the throttle is opened and the tubes brought into action one after another. Each tube, when the puddle has been drained, begins to function as a miniature carbureter with fuel entering at the jet in the bottom and air being supplied through the four small air holes just above.

By this design the fuel goes through a "two stage" atomization process; the first in the bottom of the tubes, where a heavy spray is formed, and the second in the venturi of the carbureter, where the spray unites with the main air column. The main feature of this construction is the fact that the fuel flows through the jets by gravity from the float chamber and combines with the air of the first stage at a point below the float level. This brings the partially atomized fuel out of the tube

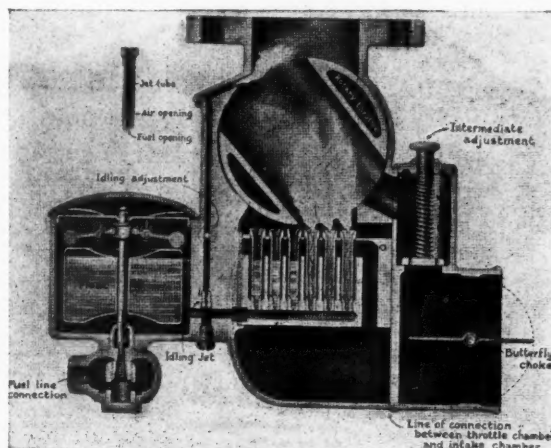
and into the venturi for the second stage without the choke restriction necessary to create a depression at this point.

Two exterior adjustments are provided. The first is for idling and is a control of the idling speed air by means of a screw in the passage. The second adjustment is for intermediate speeds and has its principal effect on the first third of the throttle range. It amounts to a control of the spring tension on a poppet valve which admits a certain amount of air during the first part of the throttle opening when vacuum is at a relatively high point. This adjustment has its greatest effect as a control for pick-up, and consequently is also an adjustment for economy. To meet any unusual requirements for a setting the standard main jets or idling jet may be changed for ones or larger or smaller size at any or all points in the throttle range.

The air intake is made in two sections with an adjustable clamping ring at the joint. The second section can be supplied as a vertical elbow which can be set at any angle required for the hot-air tubing. At the intake connection a butterfly

valve is provided as a choker or strangler for starting; this is operated by a flexible wire control from the dash.

The carbureter herein described is the same in all respects except for the two exterior adjustments as the instrument which the Miller company have been making in large sizes for marine and aeronautical engines during the past four years.



*The Miller Type H carbureter*

## Properties of Bearing Metals at High Temperatures

**T**ESTS at elevated temperatures of four bearing metals have been made for the S. A. E. at the Bureau of Standards. As was expected, the yield point and ultimate strength decreased rapidly with increasing temperature. It would appear that babbitts containing lead lose their strength more rapidly than those with a tin base. Brinell hardness measurements have also been made on these four samples, and will be repeated later on larger specimens. In order to study the effect of small quantities of lead

on the physical properties of a high-grade tin-base babbitt, varying percentages of lead have been added to metal made in accordance with specification No. 2 of the American Society for Testing Materials, and the physical properties of the various combinations thus secured will be studied at ordinary and at elevated temperatures. A thermostatically-controlled oil bath has been constructed for annealing specimens over long periods of time to determine its effect on the mechanical properties of the babbitts.

# Increase in Maximum Pressures Produced by Preignition

This investigation into a neglected field of research as to performance of aviation engines is essential to the design of an engine that shall have a known factor of safety, which is a most important objective.

By S. W. Sparrow\*

WITH the high compression ratio of the aviation engine, preignition is of frequent occurrence. That extremely high temperatures are a result is fairly well recognized, but little attention seems to have been given to the pressures that prevail in the cylinder under these conditions. It need scarcely be pointed out, however, that accurate knowledge of the maximum pressure in the cycle is essential to the design of an engine that shall have a known factor of safety.

In the course of the investigation of the effect of compression ratio on altitude performance, which is being conducted for the National Advisory Committee for Aeronautics at the Bureau of Standards, the curves shown on Sheet No. 1 were obtained. The dotted line shows the pressure

obtained with the engine operating normally, the solid line those obtained during preignition. A change of spark plugs was the only difference in engine conditions between the two runs. It appears that the charge is completely burned early in the compression stroke. It is then compressed and because of the loss of heat to the walls of the combustion chamber the first part of the expansion line falls below the corresponding compression line. As a result, the negative work of the first part of the expansion stroke is nearly equal to the positive work at the latter end, making the effective work of that cylinder practically zero.

Although the substance dealt with is not a perfect gas, the equations used in the following computation are sufficiently accurate to explain the pressure increase:

Let  $V_1$ ,  $P_1$  and  $T_1$  be the volume, absolute pressure and absolute temperature at the beginning of the compression stroke,  $V_2$ ,  $P_2$  and  $T_2$  corresponding values at the end of the compression stroke, and  $V_3$ ,  $P_3$  and  $T_3$  corresponding values after the charge has been burned at constant volume. For the 8.3 compression ratio used, if we assume the value of "n" as 1.3 in the expressions

$$P_2 = P_1 \left( \frac{V_1}{V_2} \right)^n \quad \text{and} \quad T_2 = T_1 \left( \frac{V_1}{V_2} \right)^{n-1}$$

Then

$$P_2 = P_1 (8.3)^{1.3} = P_1 (15.7) \\ \text{and} \quad T_2 = T_1 (8.3)^{0.3} = 1.89 T_1$$

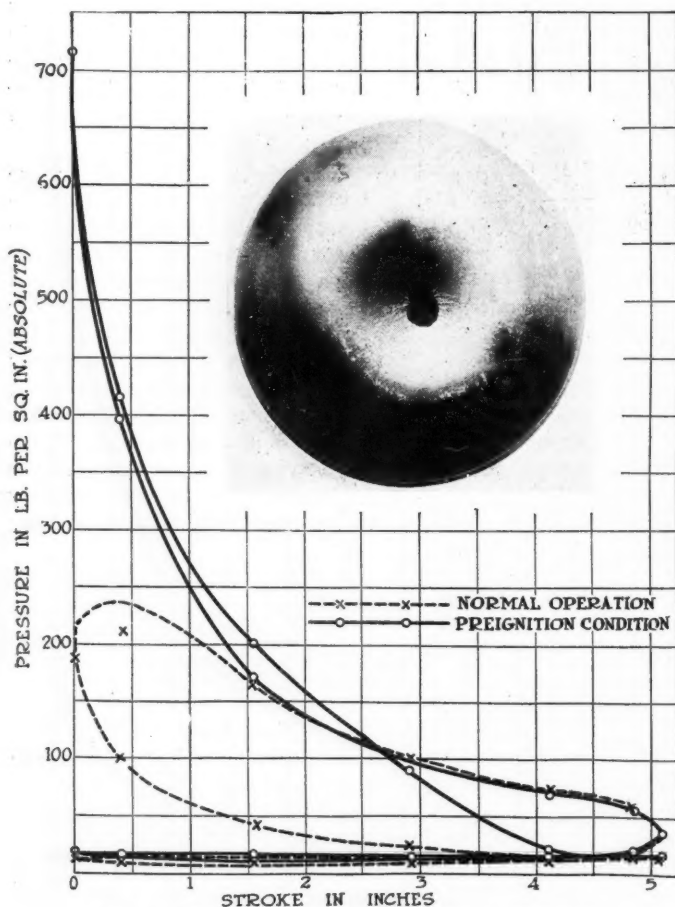
If the absolute temperature at the beginning of the compression stroke is 350 deg. C., the final temperature  $T_2$  will thus be 662 deg. C. Now assume the firing of the charge to result in a temperature increase in the mixture of 2000 deg. C. (This value is chosen small to allow for any dissociation, heat loss to walls, etc., that may exist.)

$$\frac{P_2 V_2}{T_2} = \frac{P_3 V_3}{T_3} \quad V_2 = V_3$$

$$P_3 = \frac{T_3}{T_2} P_2 = \left( \frac{2000 + 662}{662} \right) P_2 = 4 \cdot P_2 = 4 (15.7) P_1 \\ = 62.8 P_1$$

In assuming the charge to be burned at the beginning of the compression stroke, let  $P_3$ ,  $V_3$  and  $T_3$  represent the condition after the charge is burned at constant volume, but before it is compressed,  $P_2$ ,  $V_2$  and  $T_2$ , as before, representing the condition after the compression.

$$\frac{P_1 V_1}{T_1} = \frac{P_3 V_3}{T_3} \\ V_1 = V_3$$



Indicator diagrams showing enormous pressure attained in cylinder when pre-ignition occurs. Insert shows piece broken out of aluminum piston head

\*Automotive Power Plant Section, Bureau of Standards.



$$P_2 = \frac{T_2}{T_1} P_1 = \left( \frac{2000 + 350}{350} \right) P_1 = 6.7 P_1$$

$$P_2 = P_1 (8.3)^{1.3} = P_1 (15.7) = (6.7) P_1 (15.7) = 105. P_1$$

No attempt has been made to calculate accurately actual pressures or temperatures, but merely to show why the pressures obtained during preignition should be much greater than those during normal operation. The amount of this difference is, of course, influenced by the amount of dissociation, loss to combustion chamber walls, etc. Even Curve Sheet No. 1 does not adequately represent the magnitude of these pressures because with the high tem-

peratures produced the amount of charge taken into the cylinder is somewhat decreased.

At 15,000 ft. altitude where the maximum normal pressure ever obtained was 360 lb. p. sq. in. pressures of over 950 lb. p. sq. in. were obtained during preignition.

The importance of making every effort to avoid preignition is apparent. It is most important that the engineer realize how much the pressures may be increased from this cause and govern the engine design accordingly.

The accompanying photograph will serve to add emphasis to this statement and explain why these experiments were temporarily interrupted.

## A Pneumatic Tire Truck Axle

THE general adoption of pneumatic tires for motor trucks has made it necessary to rearrange or redesign the components of the truck so as to make higher speeds possible. There would seem to be four methods

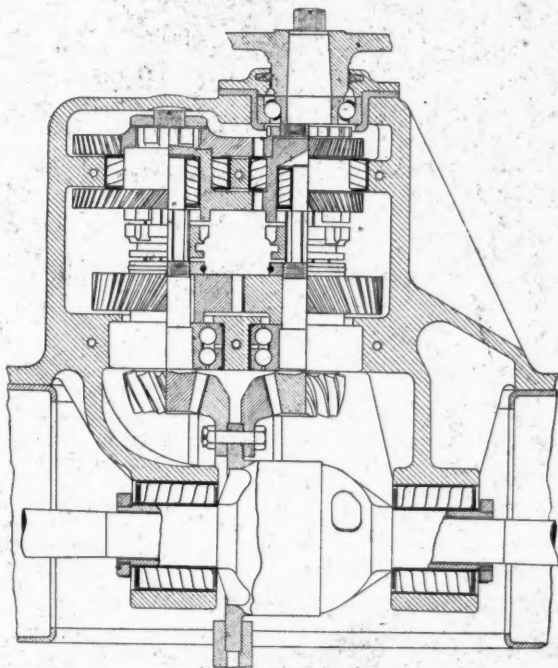
of achieving this end and all have been used by one or more manufacturers. These methods are as follows:

1. Increasing the engine speed.
2. Decreasing the rear axle reduction ratio.
3. Increasing the number of gear changes in the transmission or adding an auxiliary transmission.
4. Using a two-speed axle.

The last mentioned method is embodied in the Penrod & Wissel axle, a sectional view of which is shown. This axle is intended for 1½- to 2-ton trucks and gives reduction ratios of 5.07 and 9.3. The two-speed feature is combined with a double gear feature for which latter a wider range of efficiency than that of a worm drive and greater silence and efficiency than obtained with double reduction and internal gear axles are claimed. The chief object in using the double gear is evidently to get enough strength in a final drive gear with high reduction ratio.

The method of operation is clear from the drawing. There are two positive clutches, one on each pinion shaft. These evidently must be so interconnected that when one clutch is in the other is out. When the clutch on the pinion shaft connected to the propeller shaft is in the small speed reduction (5.07) is effective, and when the clutch on the other shaft is in the high gear ratio is obtained.

All gears in the axle have helically cut teeth. Double gears are also used for getting the extra reduction, the two gears being of opposite angle of spiral so as to eliminate end thrust. There are two pilot bearings in the axle and altogether there are nine ball and roller bearings in the central part of the axle.

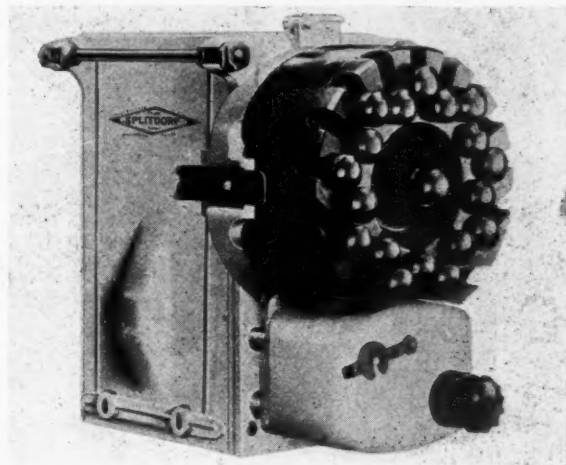


Sectional view of axle designed for a pneumatic tire truck

## Eighteen Cylinder Magneto

A MAGNETO has recently been produced which will fire all cylinders of an 18-cyl. aircraft engine. It generates six sparks per revolution of the rotor, and as an 18 cyl. engine requires nine sparks for each revolution of the crankshaft, the magneto is geared to run at 1½ times crankshaft speed. With an engine speed of 2250 r. p. m. the magneto speed is 3375 r. p. m. and the magneto generates 22250 sparks per minute. The machine illustrated herewith is the product of the Splitdorf Electrical Co.

TWENTY vehicles were entered in a commercial vehicle contest recently held at Barcelona, Spain, including the following: 2 G. M. C., 1 Federal, 1 Clydesdale, 2 Berliet, 2 Delahaye, 1 La Buire, 1 Unic, 1 Deval, 2 French Hispano Suiza, 3 Saurer, 2 Arbenz, 2 Commercar, 1 Caledon, 2 Opel, 1 Horch, 1 Faun and 1 Douar. Only the Italian industry was not represented.



Eighteen cylinder Splitdorf magneto

# Seventy-five Operations Give Accuracy in Connecting Rod Production

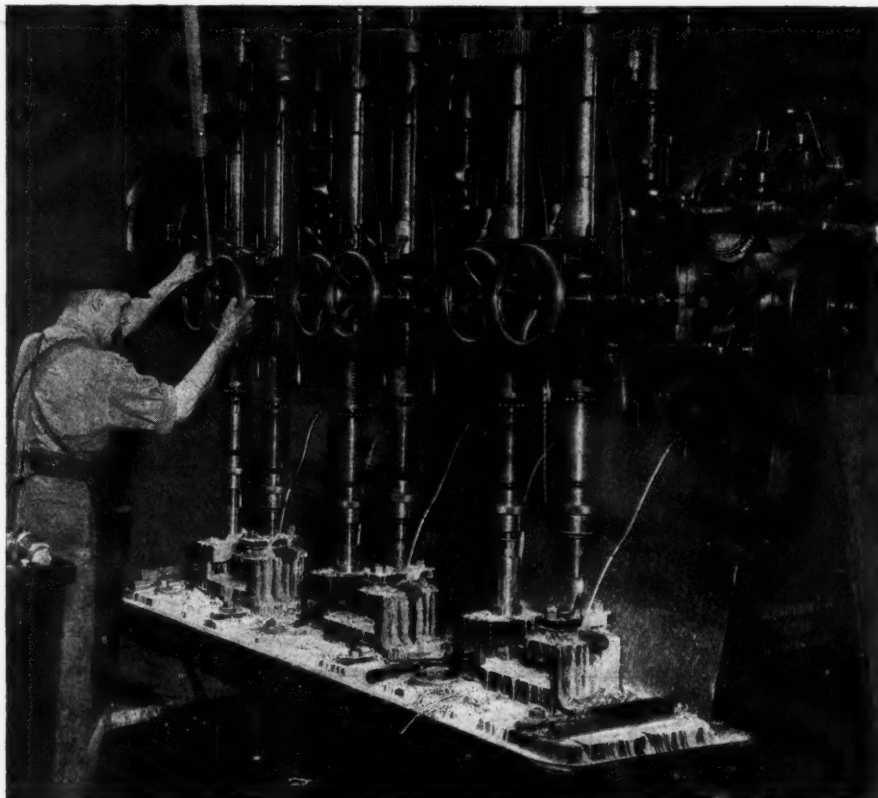
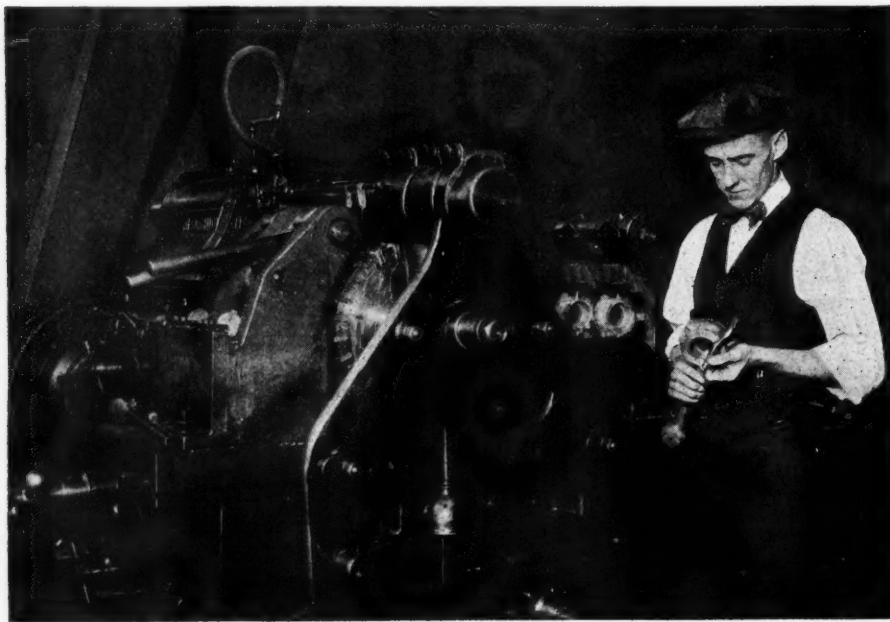
The excellence of detail in the Marmon car has long been the subject of discussion. In this article Mr. Schipper tells of the manufacture of the connecting rods, and traces the 12 pounds of metal from its arrival in the shop through the various operations until ready for assembly.

By J. Edward Schipper

ONE of the most thoroughly finished and machined connecting rods used in a production automobile is that employed on Marmon cars. The finished rod for this light weight, six-cylinder car weighs only 4 lb. 8 oz., while the original forging from which the rod is made weighs 12 lb. The Marmon plant turns out approximately 50 cars per day, or, in other words, 300 connecting rods, from each of which  $7\frac{1}{2}$  lb. of metal is removed, giving a total of 2250 lb. of metal cut per day in the connecting rod department.

To completely finish a rod, approximately 75 operations are required, from which it may be judged that this rod is completely machined in every respect to give it the desired action with minimum weight. When the raw forgings arrive, they are first inspected for hardness, the requirement being a test between 187 to 220 Brinell. The forgings are then snagged; that is, the flash is rough-ground off all around, and the forgings are then placed in raw stock storage. The first manufacturing operation is to

(Below) Fig. 1—Milling sides of large boss on Marmon connecting rods with No. 4 Cincinnati miller



(Above) Fig. 2—Drilling holes at large and small ends of connecting rod on six-spindle Foote-Burt press

straighten the rod by laying it on a special surface plate and by means of a babbitt hammer bringing the center line parallel to the surface plate, by use of the hammer if necessary.

The rod is then milled for a locating point, as shown in Fig. 1. The sides of the large boss are milled off on a No. 4 Cincinnati miller, two rods being handled at a time in a double fixture. It requires six minutes to make this cut, about  $\frac{1}{8}$  in. of metal being taken off. This milled face is used to locate all subsequent operations. The primary operation described is located by means of a V-block at the small end of the rod and a clamping jaw which goes over the sides of the large boss. It requires two of these No. 4 Cincinnati millers to turn out the 300 rods per



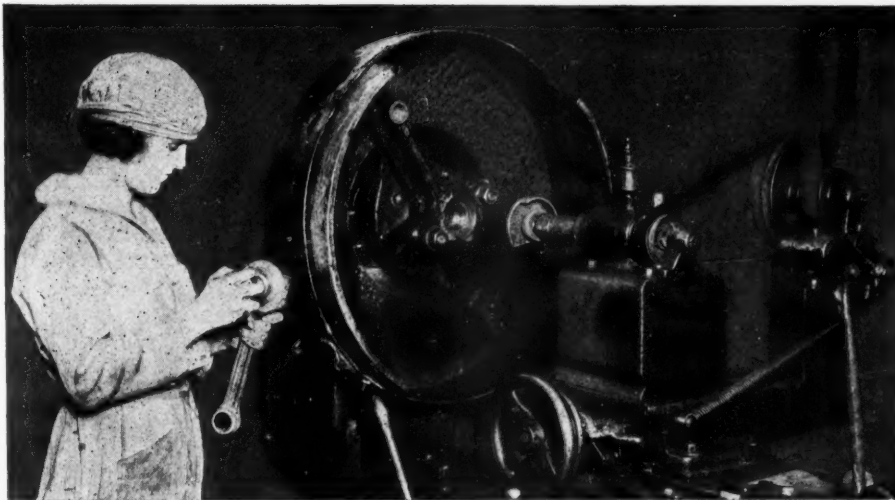


Fig. 3—Rough grinding hole in big end on Heald internal grinder

day, and the limit on this operation is plus or minus 0.002 in.

After this primary locating operation, the rod is again straightened and the burrs from the preceding milling operation are removed by filing. The sides of the small boss are then milled on a No. 3 Cincinnati miller, being located from the milled face on the big end and the V-block on the small end. One of these No. 3 Cincinnati millers takes care of the 300 rods per day. This is a finishing operation on which the limit is plus or minus 0.002 in. After this the rod is again straightened and the burrs are filed.

A No. 4 Cincinnati miller is then employed to finish-mill the end of the large boss, this operation again being followed by a filing or burring process, after which the rod is passed on to the operation shown in Fig. 2, where the piston pin holes are drilled and the holes in the big end are drilled and reamed. In performing this operation, the machine goes through first with a 1 in. drill at the small end and a butt mill at the big end. The holes are then finished with a 1-11/32 in. drill at the small end and a 2-39/64 in. reamer on the big end. The work is kept in place while the tools are changed by means of Wizard chucks. By this method the fixtures remain in place all the while, the center distances being held by the spindle heads. This work is done by two six-spindle Foote-Burt presses, which take care of the 300 rods required per day. The tolerance on this work, which is a rough cut for the piston pin hole, is plus or minus 0.01 in. for the piston pin hole, and plus or minus 0.002 in. on the reamed hole for the big end.

After burring both sides of both holes, the small hole is broached on a Lapointe broach, the limit on this work being plus 0.001 in. and minus 0.004 in.

Following the broaching operation, the rough grinding process illustrated in Fig. 3 is utilized for sizing the hole in the big end. This work is taken care of by two Heald internal grinders, with the special fixture illustrated in Fig. 3, locating the center distance endways and sideways by means of locating pins on the fixture. A rod is shown in the illustration, located in this fixture by means of the pins described. After this grinding operation, it is apparent that the holes both at the upper and lower end are properly centered, giving locating points which are utilized in the subsequent operations.

For rough turning and finish turning around the small boss, two G & K lathes are used. About 1/16 in. is taken off all around on the rough turning operation, and the finish turning operation is brought to the desired diameter with a tolerance of plus or minus 0.005 in. The radius back of the bolt bosses on the big end of the rod is bored or butt-

milled on Cincinnati-Bickford drill presses. Two rods are held in one fixture and milled at the same time. The rods are then turned over by lifting up the hinge on the fixture and milled on the other side. This radius sweeps the arc between the flange of the rod and the curve at the big end. The work is located from the two holes by locating pins on the fixture. The operation is shown in Fig. 4, and it will be seen that the two rods are in place, one lying in one direction and the other in the opposite, so as to permit the cutter to pass between them, milling the two radii at the same time.

To merge this arc with the sides of the channel, a bridge milling operation is employed, as shown in Fig. 5. This bridge mills the sides of the channel section on three No. 2 Cincinnati mill-

ing machines. A special fixture locates the rods from the holes and against the small and large bosses. The table travels, and two rods are handled at the same time. This is a finishing operation, although there is a polishing operation which follows. The limits on the work are plus or minus 0.005 in.

For the external radius around the small end of the rod, a Cincinnati-Bickford miller is used, with a special fixture and spiral milling cutter. The cut runs from the flat surface of the rod around the small end, blending the radius at the small end with the preceding milling cut.

The next operation, that of straddle milling the bolt bosses, is very often one of the first operations in other plants. This, however, is not done until the operations previously described have been completed at the Marmon plant. The bolt bosses are straddle-milled in a No. 3 Cincinnati miller, a limit of plus or minus 0.005 in. being put on the work. The location is from the holes and the sides

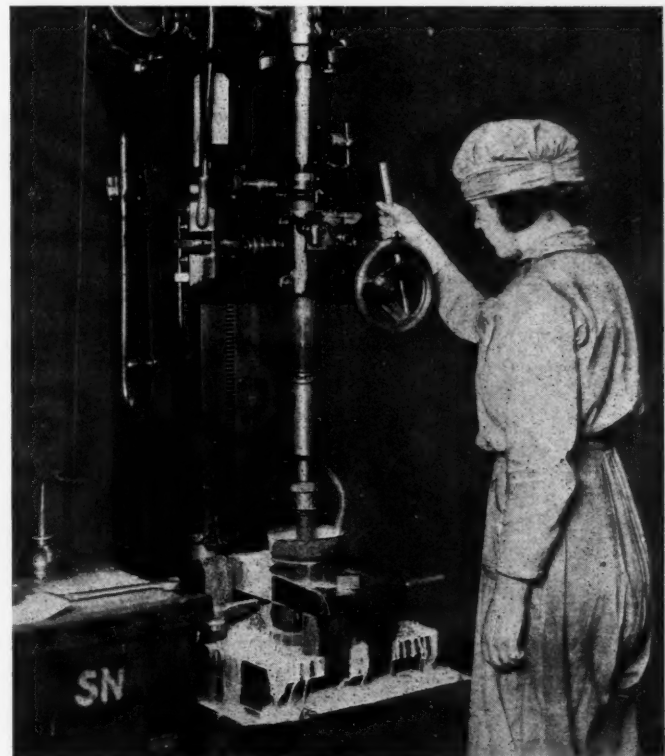


Fig. 4—Boring or butt-milling radius back of bolt bosses on Cincinnati-Bickford drill press

of the bosses. The straddle milling on the outside of the bolt faces is also done on the same type of machine and located in the same manner.

Two Aurora drill presses are utilized for finishing the  $1\frac{3}{4}$  in. radius around the large boss. This work is assisted by a special swinging fixture, the tools being stationary and the spiral milling cutter traveling. This operation is followed by a profiling operation which profiles a  $1\frac{3}{4}$  in. radius and finish profiles the edge of the channel. This is a Pratt & Whitney machine. There are two of these utilized for this operation.

The rough and finish profiling of the channel is accomplished on Pratt & Whitney profilers with special fixtures. This operation is illustrated in Fig. 6. The special fixture, as shown, locates from both holes and from the sides of the bosses. The tool is a spiral end mill cutter which profiles

one side of the rod at a time, after which the rod is turned over and the other side finished. The rough and finish cuts are handled identically, the finish web being  $\frac{1}{8}$  in. thick, with a limit of plus or minus 0.005 in.

After the profiling has been completed, the bolt holes are drilled on two Cincinnati-Bickford drill presses, with a special fixture holding four rods. The press has a multiple head with four drills which drills two holes in two rods at the same time, the eight holes in two rods being drilled in two operations. The bolt holes are reamed to size on the same kind of a machine with the same kind of a fixture employing special length reamers long enough to clear the length of the rod. Both sides of the bolt holes are countersunk, and the rods are then burred all over and scraped to remove the spiral tool marks in the channel from the profiling operation. This burring and scraping is a hand operation accomplished by files cut to proper size.

The rods are marked for identification on cap and rod, the same numbers being employed on each so as to keep the cap and rod together. The rod is then polished, as shown in Fig. 7, on all of the machined surfaces except the final locating points, which are left undisturbed so as not to destroy their accuracy. The rod is then heat treated in the furnaces illustrated in Fig. 8 for uniformity, a scleroscope test being made after heat treatment. The rods are pickled, and, following this operation, are straightened before being passed on to a Heald internal grinding machine, which grinds the small hole to size. This work is held very close, the total limit being plus 0.00075 in. and minus 0.00025 in. To take care of the rod in this operation, a special fixture is employed locating from the large hole and a V-block resting around the finish turn of the small boss, and from the faces of the large and small ends.

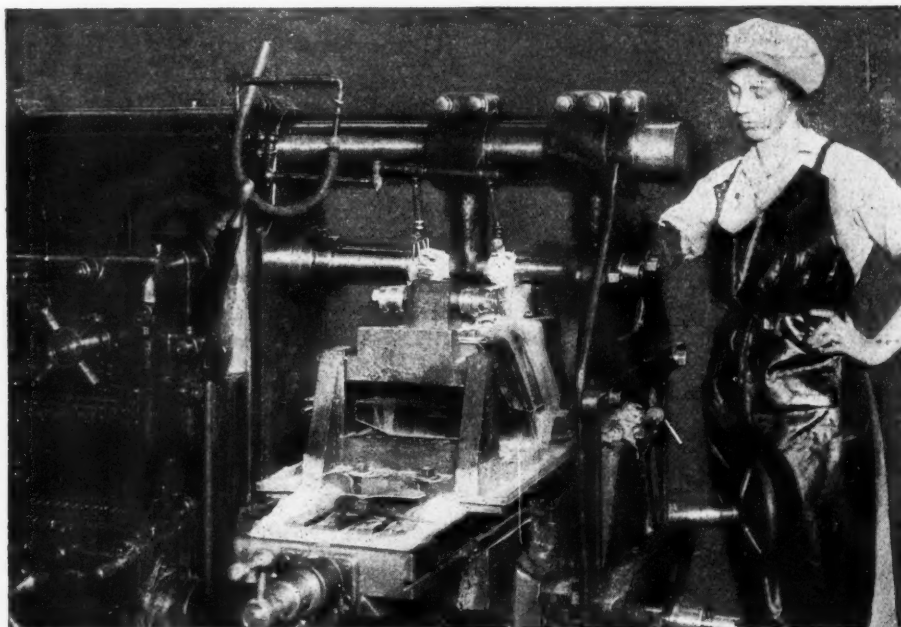


Fig. 5—Milling sides of channel section on No. 2 Cincinnati miller with special fixture

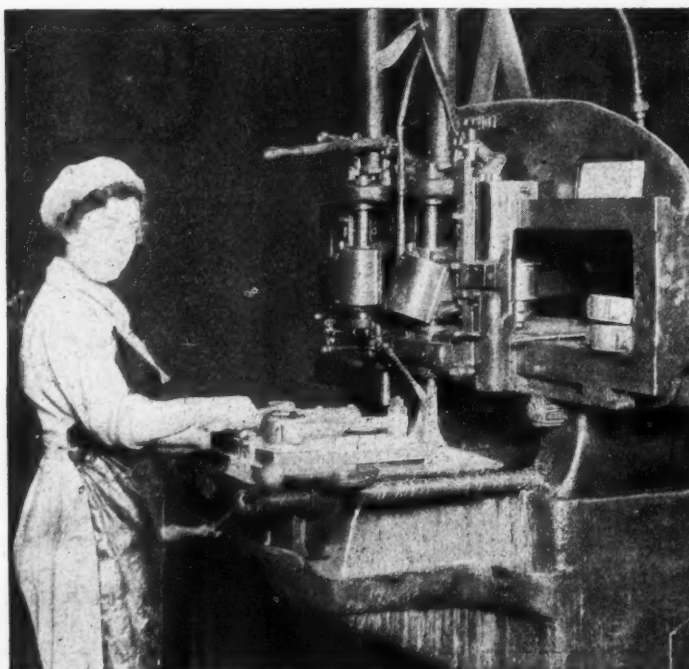


Fig. 6—Rough profiling channel on Pratt & Whitney profiler

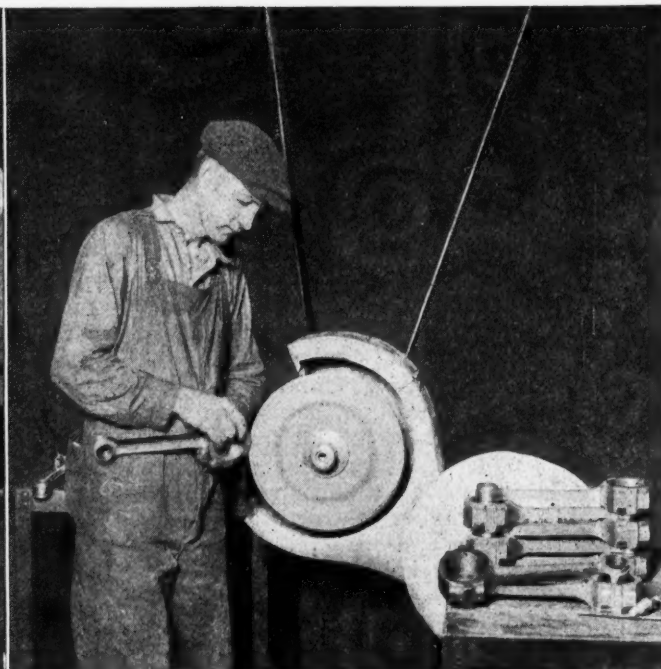


Fig. 7—Polishing rods on all machined surfaces



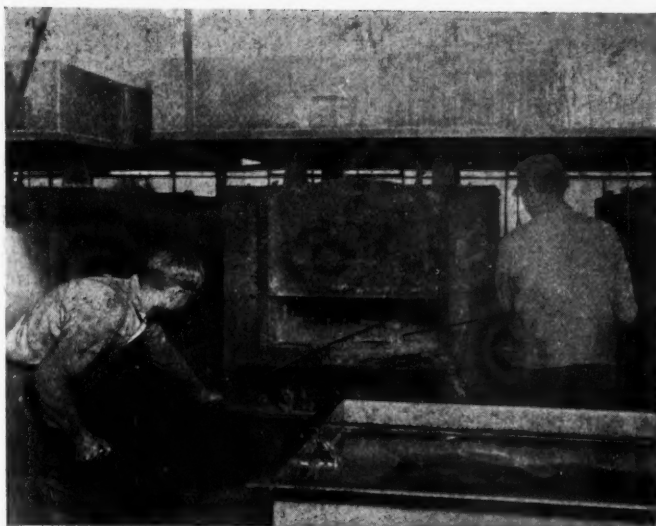


Fig. 8—Heat treating rods for uniformity



Fig. 10—Sand blasting the Marmon connecting rod

Upon the completion of this grinding work, the cap is sawed from the rod on a Milwaukee milling machine, a  $3/32$  by 4-in. high speed saw being employed. The faces of the rods and caps are ground on Norton grinders with special fixtures adapted to holding either the rod or cap, the rods and caps being in containers holding six rods and six caps at a time, or sufficient to equip one engine. A container of rods and caps is ground at a time and replaced in the container so as to hold these sets unbroken.

Following the grinding work, the cap is spot faced for nut clearance on a Cincinnati-Bickford drill press, with a special fixture to hold the cap. The facer has a pilot which enters the bolt hole, the tool following the pilot and cutting the clearance necessary for the employment of a socket wrench on the rod bolt heads. A washing operation follows this spot facing to take off the grease and grinding dust and the bolt holes are then reamed and assembled to the connecting rods with temporary bolts, in order to permit of the finish boring of the large end of the rod. This is located from the small end hole and from the finish milled faces at both ends of the rod. The boring is



Fig. 9—Surfacing the rod and cap flanges for shimless bearings

done on a six-spindle Foote-Burt machine, five of the rods being done at a time, the sixth spindle being used for chamfering both sides of the large hole, which operation immediately follows that of boring the big end hole.

A groove is then cut around the face of the large hole in order to act as an anchor for the babbitt. The sides of the large boss are ground to proper size on a Besley grinder, and a thread turned in the large hole on a G & K lathe to act as a babbitt retainer. The caps are then disassembled from the rods and the faces of the rods and caps are again ground to remove high spots. The rods are then sent out to have the babbitt die cast in place and upon their return are placed in stock from which they are drawn for continued manufacture.

The operation shown in Fig. 9 is a surfacing operation done by hand on the rod and cap in order to get the close juncture required for the shimless bearing employed. Following this, the bolt holes are reamed and the caps assembled to the rods with the permanent bolts. The surplus babbitt which adheres from the die-casting operation is cleaned from the rods, and they are then sand blasted, as shown in Fig. 10. The babbitt in the rod and the small holes are protected from the sand blast by wooden blocks.

The bearing at the big end is fly-cut on a Cincinnati drill press, a rough cut first being taken and then a finish fly-cut on one rod at a time, the limit being plus or minus 0.0005 in. This operation is located by means of a special jig, which takes its location from the small hole and from the milled surfaces at both the large and small ends of the rod. The babbitt in the big end bearing is then rough faced to width, and a radius or filet cut by means of an Aurora drill press with a special fixture locating from both holes and from the finish milled surfaces. The big end bearing is then broached, as shown in Fig. 12, on an Arbor press with a special broaching tool, the babbitt being finish faced to width on a special hand tool in which the rod is turned around by hand, the cuts blending

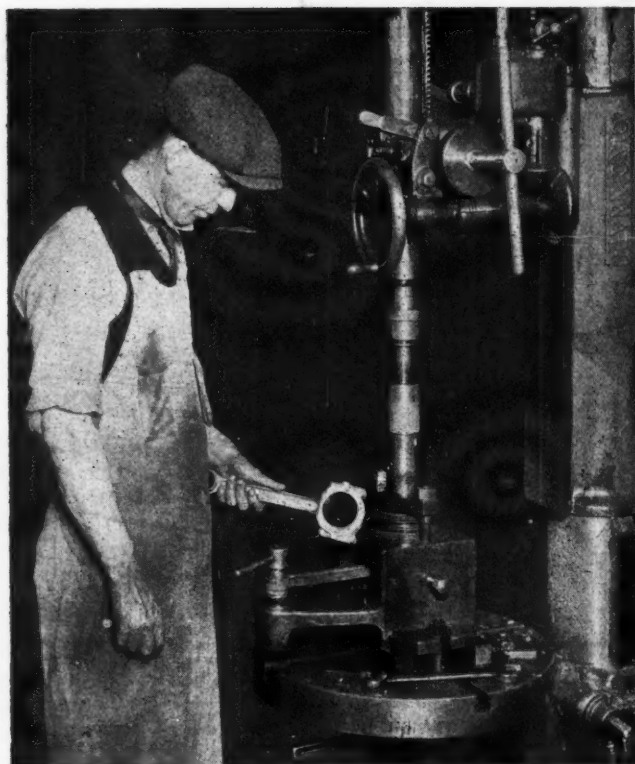


Fig. 11—Finish fly-cutting the big end bearing.  
Note the special locating jig



Fig. 13—Line reaming the piston pin bushing with a  
special locating fixture

the fillet with the face to size sufficient to clear the crankshaft bearing surface.

Following these operations, the rod is again straightened on a special fixture and the piston pin bushing is pressed in on an arbor press. The piston pin bushing is line reamed by hand, as shown in Fig. 13, the work being held on a special fixture locating from the large end, finish milled on the big end and finish milled on the sides on the small boss. The piston pin hole is rough reamed and finish reamed by hand, the final limits on this work being plus or minus 0.00025 in. The oil grooves are broached in the piston pin bushing on an arbor press, and the burrs removed by hand. The rod is then disassembled and the oil grooves are milled in the babbitt in the cap and in the rod on a Pratt & Whitney hand miller. All the burrs on the babbitt surfaces are removed and the cap is reassembled to the rod, the rod being weighed and stamped

with its weight in order to assist in proper selection of the rod in the engine assembly department.

A final straightening operation to check the alignment, both for the center lines of the small and large holes and for twists in the rod, is then performed, as shown in Fig. 14. After this checking, the rods receive a final clean-up and are oiled all over to preserve them against rust, and are then sent to the finish stock room from which they are drawn when desired for engine assembly.

ERNEST GREENWOOD, of Washington, states that 25th International Congress of International Miners' Federation has requested International Labor Office of League of Nations to undertake to find best method of establishing an International Coal Office for purpose of securing a more equitable distribution of coal throughout world.

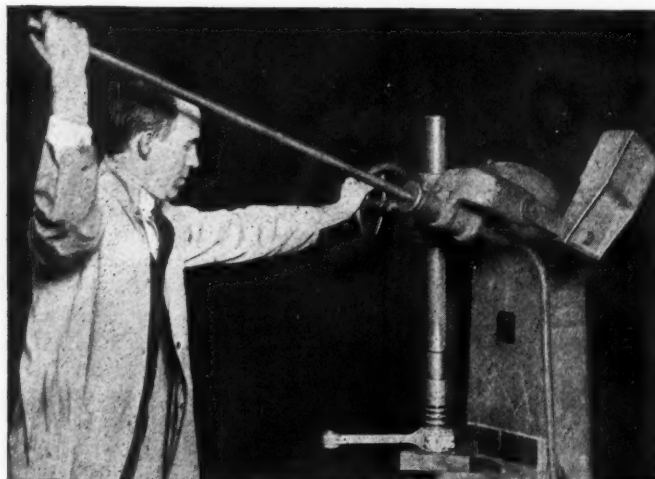


Fig. 12—Broaching the babbitted hole in the big  
end of the connecting rod on an arbor press

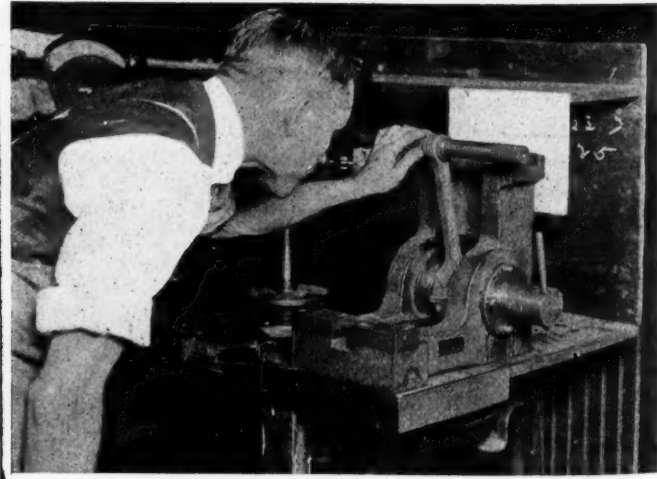


Fig. 14—Final check on the straightness of the rod for  
center lines of bolt holes and for twists in the rods



# A Small Job with Wide Possibilities for Good or Bad Results

If you go to a town but once and it happens to rain that day, you go away and tell everyone what a "bum" town it is. Such action is not just, but it is human. So it is with people who come to the information desk at your factory. This article discusses "Information desks I have met."

**T**HERE is one minor functionary in practically every firm who communicates with more outsiders every day than anyone else. He is the man at the information desk who receives visitors. The importance of his work is far greater than is generally recognized.

He meets everyone who calls at the plants. Many persons meet no one but him. Upon him, to a large extent, depends the opinion of the firm which remains in the mind of the visitor. Upon him may depend, also, the frame of mind in which the visitor transacts his business after reaching the office of the official upon whom he has come to call.

Some men in this position make the visitor ready for a fist-fight simply by the way they look up at him when he presents his card. They give him that "My-what-a-nerve-you-have-to-come-in-here" look that characterizes the hotel clerks of an overcrowded Ohio city. Psychology is a big word to use in connection with a small job but it does play a very large part in the successful handling of that job.

A visitor may go to a plant and ask to see a certain person. That person is not in. The visitor is informed of the fact by a brief discourteous "Not in." He goes away with a certain ill-will toward that organization that he did not have before. It is not sensible to spend thousands of dollars in the advertising department to build up good-will for an organization and then take chances of throwing it away by having a man at the information or reception desk who fails to fulfill his functions in the best possible manner.

It is interesting to study from this standpoint the work and attitude of the men at the information desks in various plants of the automotive industry. To begin with, the job calls for certain definite, although not necessarily highly paid, qualities.

More managements than one have placed at the information desk a disabled workman. Doubtless this has been done to provide employment for a man who would otherwise be useless to the firm. Though the purpose be laudable, the result is not good. A man who has spent most of his life in the shop is not temperamentally suited to meeting salesmen, visitors, and the type of persons who come to the information desk. He neither enjoys it nor does it successfully. Such a man is often badly educated, unable to read accurately the names of persons and firms on the cards presented to him. Nothing is more annoying to a visitor or less satisfactory to the executive than a mispronounced firm name in such a circumstance. In brief, a disabled workman is unfitted in every way for this job and he may do considerable harm to the firm by occupying it.

The next most numerous type is the boy or young man who handles the information desk as a part of his duties and considers that he is really doing the visitor a great favor to answer his questions and receive his card at all.

He considers himself *very, very* important, and emphasizes this fact by letting the visitor know that the inquiries are really very annoying in interrupting his other important business. The general manager of a plant can never hope to impress a visitor with the weighty problems which are on his mind anything like as effectively as this type of youth at the information desk. This type, as well as the one first mentioned, does the firm much harm.

The third type of ineffective man at the information desk is found only in the very large factory. This dignitary is an elderly man who has not been successful in life, feels rather bitter about it, and tries to make up for it by investing his present job with all the possible false dignity, red tape and annoying details. In one plant, he sits upon a raised dais, like a petty sovereign receiving his subjects, and \$10,000 a year salesmen walk up to his throne, stretch their necks to look over the top, obtain a glimpse of the monarch and humbly present their business cards. This "executive" is very busy, very dignified, and very imposing. In the particular plant mentioned, the attitude of this man is especially unfortunate, since the visitor, once having gotten past his austere domain, meets with a cordial and human reception by every other person, executive or minor executive, in the plant. Yet many visitors never get any further and go away with an unfavorable opinion of the whole organization.

Are there any information desks properly manned and properly conducted? Indeed there are—and they are bright spots in the dreary life of the traveling man—oases in the desert of factory reception rooms. As they impress the regular traveling man, so they impress the casual visitor or stranger who enters the plant.

A large company in Ohio furnishes a good example. The desk is presided over by two elderly gentlemen; they are gentlemen in every sense of the word. The visitor enters and is greeted cordially. Though far from exhibiting that most hateful of traits—offensively vigorous cordiality—neither of these men is afraid to smile. The visitor immediately feels at home; he knows he is welcome. He presents his card and it is read with intelligence. If the name is difficult, the gentleman at the information desk looks up and courteously asks, "Do you pronounce this '—'?" Similar treatment is accorded the visitor until he has reached his destination within the plant or until he has courteously been told that he cannot fulfil his mission at just that time. Throughout the interchange of words between the visitor and the information man, the latter has succeeded in being extremely courteous, yet neither over-familiar nor disgustingly humble. The combination is not an easy one to achieve, yet it is worth many thousand dollars to the firm in good-will every year. And there are many firms which are gaining such good-will through the effective service of the man at their information desk.

# Maintaining Prices in Spite of Rising Costs

A New England chuck manufacturer has been able to keep his prices at the same level during the last five years in spite of increased costs of labor and material. This has been accomplished, not by any magic, but by the application of commonly-known fundamental business principles.

By Norman G. Shidle

**T**HE truth of certain fundamental economic and business principles is universally known, but more than one factor operates in direct defiance of those principles. Consequently it is desirable at times to discuss those fundamentals again in the light of new experiences which re-establish their soundness.

The statement that a firm has been able to maintain the same price on its product since 1915, use the same grade of materials, and keep up the same quality of workmanship in spite of rises in price of materials, labor, taxes, and everything else, is little less than startling at first glance. Yet a New England firm which manufactures drill chucks has done just this thing; and an analysis of their methods shows nothing startling—merely the practical application of those fundamentals which every manufacturer knows, but does not always practice.

When prices and wages began to rise in 1914 and 1915, this chuck manufacturing concern sought to find a method of keeping the price of their product at the same level, maintain the same quality and still manufacture at a reasonable profit. Its officials determined to do this on the basis of a fundamental principle commonly known to manufacturers, namely, that quantity production reduces unit cost; that is, if they could increase their market so that one machine could be kept in production on a single size of chuck, instead of having to be changed from one size to another, they would be able to sell each chuck at the same price as before costs rose and still make the same profit.

The second well-known fundamental used by this firm in carrying out their price-maintenance attempt was that an article which sells cheaper than similar competing articles has an automatically increased market. A three dollar hat automatically has a larger market than a ten dollar hat because more people can afford to spend three dollars. This principle operated even more effectively in this case, since the chuck which was to be cheaper—in proportion to the higher costs—was to be the same chuck both in material, quality, and performance.

Assuming the truth of this principle, then, the pre-war price was maintained. The principle in operation "ran true to form;" the market was automatically increased to a large extent, and a long step was taken on the road to the desired achievement—a widened market, so that quantity production might be used on this small unit, a chuck. But this automatic widening of the market was not sufficient in itself to accomplish the result. Other aids were needed.

Chief among these aids has been a novel advertising campaign in which the chuck apparently played only a subsidiary part. The advertisements run in this campaign featured the drills on which the chuck is standard equipment, each advertisement featuring a separate drill. A picture of the drill appeared prominently, followed by a

description of its merits and usefulness. Then a line in the text merely announced "These drills are equipped with Jacobs chucks" or a similar statement. The name of the chuck manufacturer appeared at the bottom, as having inserted the advertisement.

This rather novel campaign of indirect advertising brought excellent results and materially aided the stabilized price in bringing demand up to the level where quantity production and further price-maintenance were possible.

The advertising had three definite effects. It benefited the chuck manufacturer who inserted it as any advertising inserted in the proper mediums would do. In addition, however, it aided in re-selling those firms which were already purchasers of this chuck. It brought additional business to these drill firms and served to tie them up more firmly than ever with this particular chuck manufacturer. One case is on record, for instance, where one of these full-page advertisements, inserted in a magazine in which the drill manufacturer himself had been using only a few inches of space, brought to that manufacturer a surprisingly large number of new orders and inquiries.

This incident suggests a third benefit which accrues indirectly from such a campaign. The magazines which carried the advertising gained as well, in that certain manufacturers, possibly not sold on the value of advertising before, had it proved to them in this costless, surprising manner, and thereafter became likely prospects as advertisers in that medium.

Though the details of the campaign are outside the scope of this article, the methods and results were novel enough to bear mention; especially since the campaign was the chief assistant of the maintained-price in bringing the orders necessary to warrant quantity production. Ten per cent of the total profits of this company are spent in advertising; a large sum in proportion to the other sales promotion work.

Thus, building upon these fundamental principles which everyone knows, but few follow out, this firm built up its market so that quantity production methods were practicable even on so specialized an article as a drill chuck.

Having accomplished this much, however, the problems were not all solved. While the market had been widened sufficiently to warrant quantity production, strict economy, efficiency in methods, and the elimination of as much overhead as possible were necessary, for costs of material and labor mounted rapidly and continuously.

The first step in the direction of efficient production was the installation of additional machinery. Six sizes of chuck are made. In the past it had been necessary to run through a lot of one size on a certain machine, then change the fixtures, run through a lot of another size, and so on. Now each machine was put on work of one size; it oper-



ated on that same size continuously. And production, of course, increased greatly. It increased far more rapidly in proportion than did the expense involved through the installation of new machinery. Consequently, overhead was automatically cut down, and again the working out of a fundamental principle automatically aided this firm in its effort to hold down its price and still operate at a profit. In addition to the automatic reduction of unit costs through the diminishing percentage of overhead charges, a definite policy of actually holding overhead and office expenses to a minimum aided considerably.

In the shop are employed about 80 men. Two men run a battery of some fifteen automatics, while two other men operate a group of five grinding machines. In nearly every case where automatic machinery could be installed to take the place of manual work, such machinery was installed. This struggle for efficiency could not be carried to its ultimate conclusion in every case, however, since great accuracy is needed in certain phases of the manufacture, and the methods which would give the greatest quantity production would not produce the highest quality work. In the case of such operations, quality was far more important than quantity and the more accurate methods and machines were preserved or installed.

Further refinements in production efficiency have grown in the designing of special tools and fixtures for the accurate performance of certain difficult operations. Many of the standard machine tools have been equipped

with specially designed fixtures, adapted to the peculiar exigencies of the work. This has done its bit toward bringing down the unit cost and enabling the firm to maintain its unit price.

In the office, the clerical and administrative work of the concern is carried on with an unusually small force. Five persons make up the entire office force, while the administrative work is taken care of by the president and general manager, the secretary and treasurer, and the shop superintendent. The sales are handled by one man. Thus, the business is not burdened with an excess of administrative red tape.

Added to this application of fundamental truths and common-sense efficiency, an enlightened labor policy has aided materially in the fight against high prices. Out of the twelve men who comprised the working force when the company started in business, eight or nine are still at the plant. Between seventy and eighty men are employed now, while the labor turnover averages only about 50 per cent a year.

This excellent record has been attained by the use of fairness and common-sense rather than by the installation of any plans or schemes. There is no piece-work in this factory, but careful attention is paid to the results which a man produces and his pay is increased steadily as his value to the concern grows. Excellent working conditions prevail as is usual in a modern plant, and especial attention is given to rewarding honest effort and exceptional skill.

A vacation with pay is given to everyone in the plant during the first week in August. This plan has been in effect ever since the company was organized and has worked out well in reducing labor turnover. Everyone gets this vacation who is employed in the plant at that time, but those who have been there less than thirty days

do not receive their pay for the vacation week until two months later. The effect of this vacation period is seen from a study of the turnover records for June and July of this year, when not a man or woman left the plant. In August, however, the turnover is higher than usual, since men are always found who take advantage of such liberality and quit soon after they have had their vacation with pay. The August turnover, though, is only about 9 per cent, so that if pro-rated over the three months, the average is seen to be very low. Thus the company gains in the end.

The successful attempt which this firm has made to maintain the selling price of its product in spite of the many excuses which it could legitimately have given for raising it, is of special interest at this time when the necessity for increased efficiency in methods is more prominent than ever. It is indicative of a sound business policy and an intelligent interpretation of economic laws. It is good business as well as good economics to mold methods and organization in such a way as to make profits

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**T**HERE is a vast difference in the way profits are made. Two firms, each making the same profit to-day, may have very different prospects for ultimate success. It is good business as well as good economics to mold methods and organization so as to make profits on an efficiently manufactured product rather than on a loosely made product, priced at "what the traffic will bear." Manufacturers will do well to think more about methods of keeping prices down and less about excuses for raising them more.

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on an efficiently manufactured product rather than on a loosely made product, priced at "what the traffic will bear." There is a vast difference in the way profits are made. Two firms, each making the same profit to-day, may have in them very different prospects for ultimate success. The last five years have furnished numerous examples of companies which have made excellent profits in spite of inefficient production and business

methods. Such firms are not only "riding to a fall" themselves, but aid in placing the industry of which they are a part upon an unsound economic basis.

It is for the tendency to base prices upon a cost plus basis, and to make that cost as small as is consistent with high quality that the development of the concern described is of interest. Common sense and sound economic reasoning has played a far larger part in their efforts than have any startling methods or novel innovations. The development indicates the line along which manufacturers in every part of the automotive field must be thinking sooner or later. Writing in *AUTOMOTIVE INDUSTRIES* recently, concerning the possibilities for lower prices in automobiles, Clyde Jennings said, "Within our own circle, we are talking of softening prices and better production from labor. But when we talk about selling prices we see differently. We can't do that and get away with it. We must talk the same out of the meeting as we talk within it. Do what you may the truth will prevail. If we are to talk lessened cost among ourselves, we must not talk increased cost outside. . . . The automotive manufacturer should price his vehicles by a carefully computed cost plus study. His profits should be ample for earnings and risk protection. If, when he places his prices, he finds that his vehicles are priced higher than those competing for sales, he should study his cost sheet and learn wherein he is not doing as well as his competitors. He should also study well his sales system to eliminate waste or loss. He cannot afford to 'cut' prices, but he must adjust them to the times and conditions."

All of which means that the business which operates on a sound economic basis, which produces a good product with all the waste effort eliminated in its manufacture, will build goodwill for itself, be on a firm financial basis at all times.

# The Salesmanship of Service in the Export Field

Cuba is one of the important foreign markets for the automotive industry and it is representative of the other countries of the West Indies and Latin America. Therefore, this article, written by Fred S. Phillips for *The World's Markets*, should be read with this large field in mind.

**S**ERVICE is the password which opens the field to foreign conquest for an innumerable number of manufactured articles. Service at home is important, but abroad it is absolutely indispensable to a successful and permanent development. A certain clear cut and interesting example of the value of service, of both the good and the bad kind, has taken place in Cuba during the past year and it will probably be of interest to relate the details.

A certain automobile began to sell in Cuba about six years ago. The first man appointed agent bought a few cars, but failed to secure any repair parts. A few of the minor parts of this car were weak in those early days. Several of the cars broke down and could not be repaired because there were no spare parts available. Some months later the agency was given to an automobile company which placed an order for a few hundred dollars worth of parts, but after getting the parts no effort whatever was made to give service and the car, which had already begun to acquire an unfavorable reputation, fell into further disrepute. Again the agency was changed and placed in apparently better hands, but the situation became worse.

Last spring a firm that had been giving much attention to the development of a service organization was offered the agency for the car. After serious consideration it was decided that the agency was worth while. In spite of its unfavorable reputation, it was believed that the car could be returned to popular favor.

## Building Up the Market

The first step was to make an exhaustive search of the market for all owners, both in Havana and through the island. With great difficulty, after tedious and disheartening labor, all owners, with possibly one or two exceptions were located. Each case was taken up individually and each owner was pacified. In those cases where the car was standing up and giving good service, the owner was informed that a real agency was being established and that an ample stock of spare parts would be kept on hand. He was also informed that adequate service by first class mechanics would be provided. Those whose cars were not running because of the lack of spare parts were furnished free of charge with all parts necessary to put their cars in running condition. In a number of cases the cars had passed from the hands of the original owners and in a few instances had been sold two or three, or even four times. Some thousands of dollars in the form of parts were given away and possibly an equal amount of money was expended in gratis repair work.

The response to this service was almost immediate. About Havana and throughout the island the bitter com-

plaints against the car grew less frequent. It was not long before favorable comments were heard and finally enthusiastic commendation came from all sides. Then the new cars began to arrive. There were not a few pessimists who predicted that the new cars would not sell. True, the sale was comparatively limited, but only limited by the number of cars that the manufacturer was able to ship.

Those who now own a car of this make declare that they are heartily pleased with it. There have been several instances where they have been offered as much as the car cost originally, after having used it for five or six months, but such offers have been refused.

## Results of the New Policies

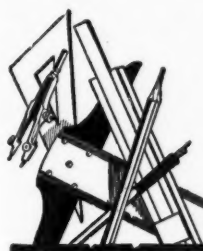
The lesson this seems to teach is that the apparently impossible can be accomplished if concentrated effort and sustained endeavor be applied. Not only was money expended in free parts, free service and advertising, but no effort whatever was made to sell any new cars until the old unhappy situation had been thoroughly rectified. No expense was deemed too great to do anything necessary to rehabilitate the car. To-day it stands in a most enviable position.

This is not due to salesmanship, or rather, it is due to the cleverest kind of salesmanship, an investment of 90 per cent in time, effort and expense in service and the balance, or 10 per cent in sales efforts. In Cuba, as well as probably everywhere else, owners of almost all makes of cars are continually complaining of the lack of service. Nor is this true by any means of automobiles only. A wide variety of manufactured goods, from alarm clocks to farm tractors, are suffering greatly and losing a tremendous percentage of sales that they might enjoy because of the lack of appreciation on the part of the agency of the fact that the best investment in the world is an investment in repair parts and an efficient expert service organization. It costs money but pays dividends.

The markets of Cuba and other countries of the West Indies and South America are very sensitive. The people are either wholeheartedly for or bitterly against whatever they are in favor of or antagonistic to. The manufacturers of locks, atomizers, alarm clocks or other articles would do well to consider the establishment of a real service department in connection with their foreign agencies.

Service is the password to the increasing success of American manufacturers abroad. Unfortunately, it seems in many cases as though the password has been lost and the manufacturer or exporter has endeavored vainly to discover a substitute, but there is no satisfactory substitute.





# The FORUM



## Fuel Economy and Road Speeds

Editor AUTOMOTIVE INDUSTRIES:

IN the Aug. 19 issue of this magazine, I notice an interesting editorial on "Fuel Economy." Recently there has been considerable published in magazines, as well as the daily press, regarding the danger of a shortage in gasoline for motor vehicles, and also many suggestions as to economy along this line.

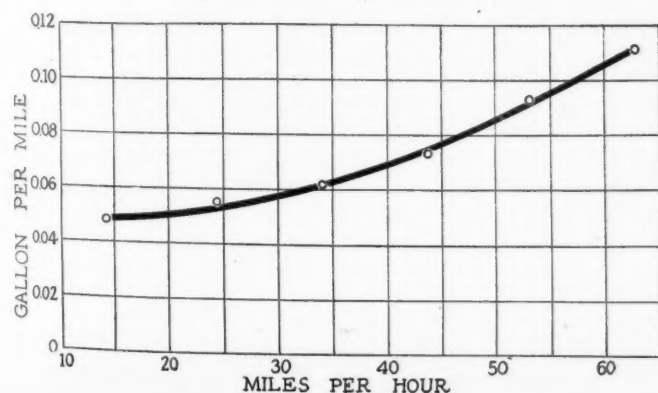
It seems to me more logical to follow the study of the efficiency of gasoline motors rather than to curtail the use of motor vehicles. The editorial appearing in this magazine suggests a very simple scheme to economize considerably in the use of fuel and, at the same time, not introduce any hardships on the automobile owner. It would be very convenient if the manufacturers of motor vehicles would publish the most economical speed of their engines; this information to consist of the speed of the car in miles per hour when running both in high gear, as well as intermediate gear, which will allow the driver to operate at the most economical speed, thus saving as much fuel as possible.

I would be interested to learn whether this data could be obtained and whether a movement could be started to publish broadcast such information on all modern motor cars and trucks.

C. R. GILCHREST.

(We believe that with most cars as now geared the most economical speed on good roads lies around 25 or 30 m. p. h. on the high gear. Very high speeds are uneconomical because so much power is then required to overcome air resistance, which increases as the square of the speed, while very low speeds are uneconomical because of the low efficiency of the engine at small loads and very low speeds. It is naturally impossible to make a definite statement as to what speed is the most economical because it depends on so many factors. For instance, if the windshield is cut down in size or entirely removed it will materially increase the most economical speed, because air resistance then becomes a less important factor.

The only figures in our possession regarding the variation in fuel economy with speed were obtained with a pair of Cadillac cars on the Indianapolis Speedway. In the economy tests the windshield and top were down, that is,



Variation of fuel economy with car speed

in the position of least air resistance. The mileages on one gallon at different speeds were as follows:

M. P. H.	14.5	24.5	33.9	43.5	52.9	62.8
M. P. Gal.	20.6	18.3	16.3	13.6	10.8	8.8
Gal. P. M.	.048	.055	.061	.074	.093	.114

This curve is not exactly of the form which we believe to correspond to normal operating conditions, as the fuel economy continues to increase below 20 m. p. h. This is probably due to the very smooth surface of the track and the fine tuning of the cars which made the rolling resistance a very small factor.

If any of our readers have similar data for other cars they are requested to communicate it, as the subject is one of considerable interest.—Editor.)

## A Latin American Guide

AN important contribution to the exporter's library is the "Commercial Travelers' Guide to Latin America," written by Ernst B. Filsinger, as one of the publications of the Bureau of Foreign and Domestic Commerce. The scope of this book, which is much larger than the customary pamphlets of the Bureau, is indicated in its introduction which states that the "volume contains, beside considerable general advice for the salesman, a great amount of information in full detail for canvassing every country and island lying south of the United States. It gives transportation routes, baggage restrictions and regulations, advice as to clearing samples at ports of entry, fees and licenses for travel, character and volume of business, and contains much useful comment that can be given only by one who has intimate knowledge of local conditions in these countries." In addition, the guide is accompanied by 30 complete maps. The book may be purchased from the department at \$1.25.

## Aircraft Nomenclature

REPORT No. 91, just issued by the National Advisory Committee for Aeronautics, deals with the nomenclature and symbols used in aeronautics and was compiled to secure uniformity in the official documents of the Government, and, as far as possible, in technical and other commercial publications. The vocabulary and symbols therefore may be regarded as standard or official. The report is in two parts, the first giving definitions of terms arranged according to major subjects and the second of terms arranged alphabetically.

## A Study in Charge Proportioning with Heavy Fuels—Correction

IN the above article in our issue of Aug. 5 there occurred a misprint on page 268, about half way down the first column. The expression  $R \propto \sqrt{P/T}$  should read  $R \propto \sqrt{P/T}$ ; that is, the  $T$  should not be under the radical

# Interest of the Worker Is Necessary to Production

Did you ever observe a boy at work on a job that merely was a means to an end and the same boy engaged in a game which he thoroughly enjoyed? If you will interest the boy in his task to the extent to which the game interests him, he will make a wonderful worker, and then you will have solved the problem applied to mature workers in this article.

By Harry Tipper

**P**HYSICAL and mental energy will remain latent unless we can awaken interest, while interest can engender energy to the point of physical exhaustion." This statement is quoted from a speech from J. M. MacTavish, General Secretary of the Workers' Educational Association of Great Britain.

The speech itself is full of thoughtful comprehension of the industrial difficulties and its analysis of the situation is as clear as the absence of any radical propaganda in it. The quotation which I have made indicates the reason why the human side of an industrial organization must be the real study of the future executive. Without interest in the work production lags and falls far behind the potential capacity of the individual worker. Where the work itself provides no means of engendering interest because of its repetitive character and its monotony, the only incentive to continue working is the reward which is secured therefrom, and this incentive operates only to the extent that will permit the worker to live without unreasonable hardship.

The difference between the capacity of the interested worker, who is impelled by his interest to put his full energy into the work, and the worker who has no interest except the day's wages has been observed in practical industrial development so frequently in the last few years that it is unnecessary to illustrate it further. This frequent illustration of the difference, however, has not lead to much investigation of the causes of the lack of interest or the means which should be taken to modify and, if possible, to eliminate those difficulties.

A great many of the industrial managers and leaders seem to feel that the present system of industry cannot be changed sufficiently to provide an interest great enough to bring out the latent energy of the man, or else they have studied the matter so little that they conceive the interest can be awakened by hand-shaking, by publications designed to produce a surface enthusiasm and by welfare work which may acquaint the men with each other and their supervisors more closely.

If we were obtaining from a piece of machinery so little useful work in proportion to its latent capacity for use, the improvement of this condition would be the object of study by thousands of men especially detailed for the work and with full power to act therein. This enormous waste of the latent human energy, however, goes on continuously without any particular attempt to study its reasons and to devise systems of manufacturing which will be more efficient in promoting its use.

From time to time, in these articles, I have pointed out the difficulty of retaining the worker's interest in occupational work which has become so repetitive and mechanical in its character that it affords little play for the imagination and less play for the creative or constructive idea.

Even the work of the executive with its manifold problems and the interest of its constantly changing outlook, contains sufficient routine to fill the individual with the occasional desire to escape from its necessity and forget the binding effect of its imperative requirements.

So we find through the whole of the United States, a tendency for executives and supervisors to recognize the necessity for relief from the pressure of daily business and, consequently, a tendency to shorten the hours of labor and to provide more frequent intervals of escape from it.

It is not so many years ago that executives, with whom I had to deal, were accustomed to work long hours at the office and take their work home with them frequently, when they were obliged to leave the office at night and over the week end.

Most of these executives, when I see them to-day, are spending much less time at their office, are wisely keeping themselves occupied with other things after office hours and expanding rather than curtailing their week-end relaxation.

This is as it should be. The intense activity required in the discharge of these responsibilities cannot be efficiently conducted unless there are sufficient intervals for relaxation and recreation. It is only in this way that the judgment, the foresight and the capacity to vision properly the practical necessities can be kept up to its maximum efficiency.

However, the point which I am making is, that wherever the individual is free to control his time to some extent, the tendency is for him to work shorter hours and escape from his work more frequently. You will observe that this tendency is curiously like the demand of the labor union when it is examined in this bald way, and while it arises from different necessities, the fundamental desire, as the background for its existence, is much the same.

The mental strain which comes to the individual worker at the machine is of a different character than that which is borne by the supervisor and executive. It arises not from the intense activity demanded by the responsibility, but the repression of the normal activity, repressed by the lack of the responsibility. Just as ex-



treme heat and extreme cold have something of the same effect upon the skin from the contrary causes, so the repression of mental activity due to the definition and limitation of the worker's operations has much the same effect subconsciously as the demand for activity of an intense character has upon the executive. Except that the responsibility which is imposed upon the executive by the very character of his work, carries with it a visible obligation which will induce him to put all his energy into the progress of his work, so that he is able to accomplish what should be done without requiring definite hours and definite working schedules in which to do it.

On the other hand, the lack of responsibility and the lack of interest which characterizes a large part of the work required of the operator, fails to awaken or to maintain an interest sufficient to induce the use of all the latent energy. Rather, it induces a desire to limit the toil and escape from the work so that the latent energy may be spent upon matters which are interesting.

Many people of serious minds and great enthusiasm for improvement have talked at length about the absurdity of the workers complaining of the daily exhaustion of their monotonous work and then spending their evenings to a late hour in dancing, in flying from one amusement to another or in other exhausting social pursuits. Instead of being absurd and an illustration of lack of intelligence, this is logical and to be expected.

Latent energy which is not put into the work on account of the lack of interest must be expended in the pursuit of those objects which are interesting to the individuals concerned. Many times golfers with whom I have played have remarked that they would find it difficult to walk ten miles except under the direct necessity, whereas they find it neither difficult nor tiring to consume more effort in walking ten miles over the golf course. It is no different with the worker.

A girl who has been tired almost to the point of exhaustion by sitting at a sewing machine in a clothing factory all day, does not find it tiring to dance for three or four hours in the evening.

The biggest job before industry is to find means of interesting the worker in his work so that the latent energy which is developed only by interest can be applied to the useful occupation. This can be done only by a thorough comprehension of the fact that interest demands a useful object and an under-

standing of the usefulness of the object, and further it can be maintained only by the work itself or the conditions of the work allowing some play for the creative imagination in the development of the work. These two things are the fundamental necessities which must be taken into account in any organization developments looking into the improvement of production from a general standpoint, by the use of the latent energy applied to the occupation.

The success which has been obtained in a number of establishments in improving the production rate has been due to the fact that the interest has been awakened to some extent either in the job or in the company, and a little better understanding of its object has been secured. In none of these cases has the development been of such character to fulfill the conditions entirely or even to a very marked degree and the success which they have obtained in comparison with average results suggests the possibilities of success which await the men who will work out with reasonable care organization necessities with a full consideration of these factors.

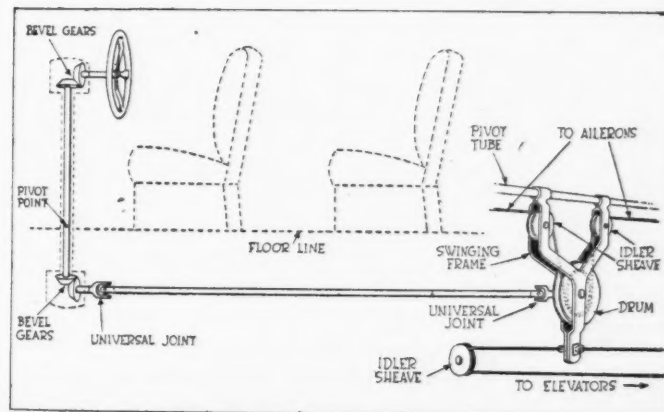
The concern that has been able to improve its production over the average in its field by 172 per cent by securing an interest in the company and a confidence in the company's policy can still further improve that production by considering the other items which go to make up the complete interest incentive and how they can be applied to the workers in their organization. In fact, the possibilities which lie before them are greater in their value than the results which they have obtained up to the present, and these results themselves are sufficiently amazing.

There are still manufacturers and executives who did not believe that attention to the human side shows its success in dollars and cents in production. The success of two or three hundred establishments who have seriously attempted the matter sufficiently answers this statement. In few cases has the increase of production effect been less than 75 per cent and in most cases it has been sufficient to reduce the total labor cost on the unit of production by a very considerable percentage, despite the higher prices which are paid to the workers. As this is the case, with the limited experiments we have made up to the present and the limited knowledge that has been behind these experiments, it is obvious that production improvement in the future can be greatly advanced by conscientious study of the human necessities.

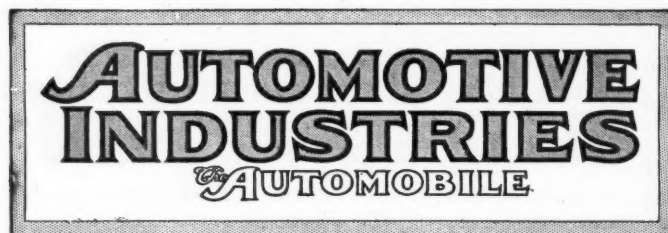
## A Steering Column That Rocks and Turns

THE diagram shown herewith represents the control system on an Aeromarine boat recently exhibited at New York. Practically all of the mechanism is located below the flooring or behind the rear seats. The horizontal connecting tube is given a reciprocating movement by rocking the control column, and in turn this movement operates the elevator cables by rocking the frame carrying the aileron cable drum. Turning the control wheel rotates the horizontal connecting tube, which in turn operates the aileron cables by means of the drum shown. The system was developed with a view to locating the control cables and mechanism out of sight, following in a sense automobile practice.

THE Belgian Automobile Manufacturers' Association has decided to follow the example of the French association and has forbidden its members to take part in the French Fair in Brussels.



Control system of Aeromarine boat 50-B-2



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## Manufacturer to Manufacturer

**C**RITICISM and advice are always more cordially received from a friend than from a mere acquaintance. A suggestion to a practical man will have more weight if it comes from another practical man than if it is given by an outside observer. Thus the advertisement which appeared prominently in the campaign of an Ohio machine tool concern has a peculiar interest as regards the importance which the human element in production has assumed in the minds of practical men.

Across the top of a full-page advertisement, the following quotation from a recent S. A. E. paper appeared, "Production Without Human Co-operation Is Impossible." Following a little below in smaller type was, "To co-operate with your employee is to help him give you the best results. Because of the accuracy and easy operation of the Warner & Swasey Turret Lathes the employee can deliver the greatest volume of production. Warner & Swasey Turret

Lathes mean satisfaction to both employer and employee."

It is an encouraging and refreshing sign. When the necessity for a study and understanding of the human element as related to production is considered so important by one firm of manufacturers that an important unit of their selling campaign is woven around it, there is indeed cause for hope. To realize the importance is, of course, only the very beginning of the way to ultimate solution, but a wide-spread recognition of the right direction is something. It is a distinct advance over some less clear perceptions which are far from being entirely disregarded in connection with this phase of industry.

## The High Class Small Car

**I**T has often been remarked that there is on the American market no really high grade small car, a class of car of which there are numerous examples in Europe. Such a car would be built of the very best materials throughout, so as to be not only serviceable but an object of pride to the owner and at the same time economical to run on account of low fuel consumption and long tire life. It would also be reliable and durable.

There are good reasons why there have been no cars of this class on the market here. In the first place, if all materials used were of the highest class, the selling price of necessity would be considerably higher than that of our leading small size, quantity production cars. This would necessitate production on a moderate scale which would further increase the cost of manufacture. There would, therefore, be a very large price difference between the serviceable small car of which we are now producing in quantity and the high grade small car, and the difference in value would not be very apparent unless one looked quite close.

To-day a small five passenger car can be bought for less than \$1000, while a car of about the same size with real leather upholstery, high class body work and corresponding design and finish in the chassis could not be sold for less than \$2000, if produced on a scale warranted by the market for cars in that price class.

The whole experience of the automobile business in this country, however, has been that people who are willing to pay \$2000 or more for a car want a big car. They may not really need an exceptionally roomy car, but they want it just the same, because of the social prestige that a large car carries with it. Even the appearance of bigness is an advantage, and body builders are diligently studying lines and forms that make a car look larger than it really is. In the minds of the American public the small car and the cheap car are synonymous and people who do not want to be open to the suspicion that they are compelled to economize will not buy a small car.

As human nature cannot be quickly changed any attempt to market in this country a smaller car of the highest grade would have little chance of success. This is unfortunate, for the reason that the use of heavy large cars for work which light cars could do



equally well is a great waste. Perhaps the only practical remedy consists in gradually reducing the size of stock models from year to year.

## Plantation Fuel and Rubber

WE recently referred in these columns to a report of a British committee in which the conclusion was reached that the production of fuel alcohol from vegetable material which could be used as food, or grown on soil which might be used equally well for growing human food, would not be practical in the long run. This conclusion has not carried conviction in all quarters, however. Certainly, as long as we need only bore a hole into the ground to create a copious flow of liquid hydrocarbon fuels it seems folly to try to produce equivalent fuel by the tedious and expensive process of growing starchy vegetables and converting their starch into alcohol. But when it becomes impossible to obtain sufficient petroleum fuel to meet the requirements we will probably have to resort to alcohol anyway.

There was a similar development in the rubber business. Originally all the rubber required for industrial uses was obtained from the primeval forests of Brazil and other states. The hevea trees were not planted; the forest districts were not available for agriculture, at least not immediately, and altogether the recovery of rubber from these forests was very similar in its economic aspects to pumping oil from the earth. In each case there was an immense original store or source of the material which was gradually being exhausted.

When the automobile industry got into its stride, about 1908, the supply of rubber from the Brazilian forest became inadequate, and prices rose abnormally. Para reached a topnotch figure of \$3.08 per pound in the New York market. To-day this same Para sells at about 35 cents a pound, in spite of the enormously increased demand for rubber tires and the reduced general purchasing value of the dollar. This happy turn in the rubber market—from the standpoint of the automobile industry—has been entirely the result of the rubber plantation movement. To-day the bulk of the rubber used in our tires is grown on plantations, on land which no doubt could be used equally well for growing foodstuffs. Notwithstanding this fact it sells lower than rubber grown without any human effort in the Brazilian forests ever sold before there was any plantation rubber.

The history of rubber cultivation really augurs well for the success of motor fuel production from tropical vegetation.

## Sources of Future Trouble

A SENSE of injustice need not be strictly personal with every individual in a plant to create a general grievance. It is easy to become indignant over wrongs to another. Thus one group of workers in a factory, though paid fair wages, may be suspicious of the management because another group is not treated with justice. The feeling may exist that if the man-

agement is unfair in some cases, it is likely at some future date to be unfair in others. This feeling causes suspicion to arise among the workmen at any new proposal the management may make.

A case in point is the practice of a small New England manufacturer who employs both men and women at similar machine work. All work in this plant is on a day-rate basis, and the men who are skilled operators are paid good wages; as good as is necessary to insure their continued presence at the plant. The women, according to an executive of the company, do fully as satisfactory work as any of the men; one woman, in fact, exceeds the best men in productive ability and steadiness. Yet, according to this same executive, the wages of the women average considerably lower than those of the men. The unfairness is self-evident.

Labor trouble has not been experienced at this plant in spite of this condition. That is no sign that it never will be. Difficulties due to such causes, however, are likely to be slower in starting and gradual in development. Self-evident injustice cannot survive successfully forever.

## Dealer Confidence

A SHORT time ago, when it was impossible for automobile factories to supply their dealers with enough cars, there was much criticism aimed by dealers at the manufacturers in regard to favoritism. It was a frequent statement that dealers who came to the factory and bedeviled the sales manager personally were given the preference over those who took his shortage statements as true and stayed at home. Such difficulties did not aid in building up the spirit of co-operation between manufacturer so necessary to ultimate success. The importance of this co-operation was emphasized recently by Mr. Jennings in an article in AUTOMOTIVE INDUSTRIES.

Trucks and tractors are still in great demand. Many dealers are unable to get as many as they can sell. The problem is the same as it has been with passenger cars, and as it is likely to be again. Yet the same unfortunate methods are being used by some manufacturers. A Pennsylvania tractor dealer recently made a trip to a Michigan factory and brought away 14 tractors with him. He saw them loaded on the cars and started on their trip.

On the way home he said: "The only way to get them is to go to the factory. You can telegraph or telephone, and it doesn't do any good whatever. While I was sitting in the office of the manager from whom I got my fourteen tractors, he talked to three other dealers over the long distance telephone. He told each of them that he absolutely did not have a tractor in stock—and I got fourteen of them because I went right out and camped there. Then you have to slip a little money here and there. It cost me \$50 in 'slush' money, but I got the tractors. It's the only way you can get them; I've tried every other way."

Such business practices will never build up a sound sales system. They should be shunned and condemned by every manufacturer who wishes to develop an honest business on a firm foundation.

# No Fear Felt of Economic Calamity

## Careful Students Growing Confident

### Inevitable Post-War Readjustment Not Bringing Financial Disaster

NEW YORK, Sept. 7—Floating through the numerous cross currents of the muddled industrial situation are straws which indicate that the post-war readjustment, which was inevitable, is being brought about gradually and in such a way that it will be accomplished without financial disaster or economic calamity. This is the conclusion generally arrived at by careful and competent students of the situation.

While reaching their conclusions by different routes, the Federal Reserve Board at Washington, the New York Federal Reserve Bank and the committee on statistics and standards of the Chamber of Commerce of the United States and the National City Bank of New York all are of the same opinion.

"A definite trend seems to be slowly developing toward a gradually increasing gain of supply upon demand and a somewhat lower level of prices," says the Chamber of Commerce committee. "Here and there mills have shut down. Here and there they are running on reduced time. It is a scattered and local matter rather than a general proposition. The automobile industry seems to be headed toward a somewhat lessened output."

Inability of the railroads to meet the transportation problem is held responsible by the Federal Reserve Board for the present industrial and credit situations. In a review of conditions it is stated that the notable development of the month has been a tendency on the part of commercial rates of interest to go slightly higher, notwithstanding the maintenance of the same rates of rediscount at Federal Reserve institutions.

### Industrial Activity Slackened

The board points out that industrial activity in many lines has been shortened in consequence of lowered demand, cancellation of orders and general readjustment. A late but important factor which has been noted by Government agents is the development of unemployment throughout the country. Inadequate transportation is mentioned as the cause of the labor surplus. The old charge that lack of farm labor was due to the competition of the automobile industry was repeated in a report from the Chicago district, which said:

"Absorption of labor by the automo-

bile industry and by other lines of endeavor offering abnormally profitable and excessively high wages has seriously hampered the ability of producers of other commodities to maintain their production profitably."

In general, however, manufacturing organizations have succeeded in enlarging their efficiency through a better spirit of co-operation by the employees.

The National City Bank, the greatest financial institution in the United States, asserts in a general review of business conditions that August has brought satisfactory developments. The bank finds that "the general trend is towards normal and permanent conditions."

### Banking Feeling Better

"There is a better feeling in banking circles as to the credit situation, although money will remain tight," the review says. "The recession in industrial activity which is under way is not severe enough to be alarming, but it is incidental to finding a lower level of prices. The industrial field over, the general trend of prices is downward and the pressure is slackening with an increase of unemployment. There is a slackening in the demand for our products abroad and an increase in our own importations, both of which changes have an influence for lower prices in our markets."

The Federal Reserve Bank of New York declares that "manufacturers and merchants have at last come to realize that the period of constant expansion of the past few years, based upon the constant increase of the buying power through credit expansion, should cease and that they should content themselves with a more stable and conservative volume of business. This realization has come simultaneously with the determination of consumers to combat high prices by reducing purchases."

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### MUST CHANGE TIRE NAME

WASHINGTON, Sept. 4—Orders have been issued by the Federal Trade Commission requiring the Great Republic Tire & Rubber Co. of Muskogee, Okla., to discontinue its brand name, "Great Republic," upon its products, stationery and advertisements because of confusion in the public mind resulting from the similarity of the name to that of a long established competitor. The company has agreed to discontinue use of the name.

### HUPP PRODUCTION 20,705

DETROIT, Sept. 4—During the fiscal year 1920, ending June 30, Hupp Motor Car Corp. made and shipped 20,705 cars. This is an increase of 82½ per cent as compared with the fiscal year 1919, and represents the company's largest production year.

## Harding to Address M.A.M.A. Delegates

### Reserve Board Governor Listed for Principal Speech at Credit Session

NEW YORK, Sept. 7—W. P. G. Harding, governor of the Federal Reserve Board, will be the principal speaker at a joint meeting of the credit and advertising departments of the Motor and Accessory Manufacturers' Association at the Hotel Statler, Cleveland, the afternoon of Sept. 16. It will be the first official appearance before the automotive industry of one of the most powerful figures in the finances of the world.

The general theme of the Cleveland meeting will be, "Conditions in the Industry," and Governor Harding is expected to discuss the financial and credit situation from this viewpoint. The session is expected to be one of the most important ever held by the association. The directors will meet while it is in session and executives and general managers of the leading parts manufacturers of the country will be present as well as their credit and advertising men. Prominent representatives of the automobile manufacturers and dealers also have been invited to attend.

Men best qualified to speak for the various branches of the industry will tell of conditions as they are to-day and what may be expected to-morrow. Every effort will be made to develop helpful suggestions and foster a spirit of co-operation. The general session Thursday afternoon, at which Governor Harding will speak, will be followed by a banquet Thursday evening. No program has been mapped out for the dinner, but at the one last year there were no speeches and the entire evening was devoted to cabaret features and food.

Friday morning the credit men will begin their own session with a discussion of technical credit subjects and the advertising managers will take up themes of vital interest to them.

### Discuss Advertising Plans

"How Should Present Conditions in the Automotive Industry Affect Our Advertising Plans?" will be the subject taken up by the advertising men Friday morning. It will be taken up in detail in its relation to national magazine business, paper, newspaper, direct mail, outdoor and motion picture advertising. William Huff, advertising manager of the Detroit Pressed Steel Co., will be the principal speaker. His subject will be, "How Can Advertising Prestige Be Converted Into Immediate Cash Sales?"



# Tour Shows Banks Open to Trucks

## Dealers Found Slow to Sales Chances

### No Need for Utility Propaganda in Middle West—Passenger Car Loans Barred

OKLAHOMA CITY, Sept. 3—While the great agricultural states of Kansas, Oklahoma and Missouri have been thoroughly sold on the money earning value of power farming, they offer almost a virgin field for the truck salesman. Strangely enough most of the dealers in this territory, especially in Oklahoma, appear utterly indifferent to the profits that are lying in their own back yards waiting to be picked up.

This has been the most striking point disclosed by the tour of automobile advertising managers and truck enthusiasts arranged by Senator Arthur Capper and which started from St. Louis for the two-weeks tour of the greatest grain growing section. The party has been greeted everywhere with whole-hearted hospitality and enthusiasm. The purpose of the tour was to preach the essentiality of automobiles, but it was found no education was necessary.

An especial drive was to be made upon bankers but they knew as much about the value of trucks and tractors as the members of the party. There was no need to present facts and figures to them. They give all the credit asked on good security for trucks and power machinery. The prospective purchaser of a passenger automobile, who hasn't the cash to finance the deal, has hard sledding, however. The bankers, almost without exception, shook their heads gravely when passenger cars were brought up.

#### Hands Tied on Car Paper

"We don't question that a large proportion of passenger cars are used for business purposes," they said in substance, "but we couldn't take care of them if we wanted to. The Kansas City Federal Reserve Bank has sent out an order stating that it positively will not finance passenger car paper.

"Most of our business is with farmers. They need a lot of money to finance their crops. We are glad to loan to our depositors in good standing if they want to buy trucks or power machinery for we know it will increase their earning capacity, but we haven't funds to handle passenger cars for them. While the Federal Reserve Bank won't take this paper they have not the slightest objection to accepting for rediscount all the good truck and tractor paper we have to offer. The trouble is that dealers have

been pushing passenger cars too hard and not devoting enough of their attention to trucks."

The worst enemy the motor truck has in all this great territory is the careless, thoughtless and unreasonable dealer who sells trucks to persons who ought never to buy them. Many trucks have been sold to persons who were able to make only a small cash payment and expected the banks to carry a series of notes covering a long period with the idea of paying them out of the earnings of the truck. In many cases the truck has been able to carry the burden but in more it hasn't and the banks have been the sufferers.

#### Dealers' Attitude Amazing

The indifference of the dealers to the market that is open to them is amazing. They still are trying to push sales of passenger cars when they know there is no credit to finance them, but it seems never to have occurred to many of them that they can sell trucks. They admit they are not selling many cars but when asked if they are pushing truck sales shrug their shoulders and say:

"If they want to buy trucks we have them. All they have to do is to come in. We'll be glad to sell."

These three states have had wonderful crops. The farmers don't attribute this happy condition to Providence but to tractors. They say that tractor drawn plows dug so deep into the fertile soil they couldn't fail to have bumper crops. With power machinery they were able to plow and plant early when the soil still was wet and when horses could not have dragged the plows.

Thousands of farmers have tractors now and thousands more have vowed to buy them as soon as they get rid of their crops. The Cardwell-Lyman Sales Co. of this city has sold 600 tractors in 18 months and 27 trucks in the last 8 weeks, to say nothing of 346 lighting plants and 100 straw spreaders in a year. They are disposing of gas engines as fast as they can get them.

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#### REPUBLIC CAN'T GET PARTS

ALMA, MICH., Sept. 3—Republic Truck Co., which closed down two weeks ago for the annual inventory, did not reopen as planned. The inventory practically has been completed but Vice-President Hayes said the company had been handicapped in not getting necessary parts in sufficient quantity to justify resumption of operations Sept. 1 and expressed the opinion that the plant would not start again before Sept. 15. Hayes said the company had been shipping many trucks during August and declared estimates for September showed the slowing up in demand rapidly was passing.

## Commission Charges Implement Restraint

### Recommends Proceedings by Department of Justice to Restore Competitive Conditions

WASHINGTON, Sept. 6—The Federal Trade Commission to-day recommended that the Department of Justice should institute judicial proceedings against the National Implement and Vehicle Association, the Southern Wagon Manufacturers' Association, Carriage Builders National Association, the Agricultural Publishers' Association and organizations of dealers and manufacturers of farm implements which the Commission charges restrained trade and unduly enhanced prices. The Commission also urged that the International Harvester case should be reopened to insure a plan of dissolution that will restore competitive conditions in the harvesting machine business.

The report was made in response to a Senate resolution directing the Commission to ascertain causes of high prices for farm implements. Several manufacturers of automotive farm equipment and motor trucks were included in the investigation. The Commission concluded that "farm implement manufacturers and dealers by concerted action advanced prices in 1917 and 1918 by amounts that were larger than were warranted by the increase in their costs and expenses, and this resulted in unusually large profits for those years." The Commission expressed the opinion that:

#### Harvester Still Dominates

"The partial dissolution of the International Harvester Co. in 1918 did not change the dominating position of that company in the harvesting machine line and will not do so while the McCormick and Deering plants and the steel business remain united under its control either directly or by common ownership of stock."

The inquiry into the financial returns for 200 implement dealers in 1918 as compared with 1915 showed that the most of them handled automotive equipment and other articles as well as implements.

"The net sales increased 60 per cent, the gross profits, 75 per cent, the total expenses, 38 per cent, the net income, 152 per cent, the investment, 28 per cent, while the rate of profit on investment increased from 9 per cent in 1915 to 17.7 per cent in 1918, which is an increase of 97 per cent."

The Commission investigated 22 farm implement manufacturers, embracing

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## West Grasps Need of Cautious Steps

### Prudence Observed in All Lines —Encouraging Signs in Situation

CHICAGO, Sept. 7.—Following the urgent appeal sent out, arising in a large measure from the dearth of liquid capital and bank credit restrictions, that prudence be observed in all lines of business, the Middle West has shown a conscientious regard in conducting its business with a decided show of caution. To it the need of marking time has been patent.

There is every indication that the appeal for caution has reached out of the industrial line and has affected the individual purchaser. Consumers are not now as active as they have been in times past, when there was much extravagant buying of all commodities; they are taking longer time over their purchases and paying stricter account to them. The restriction of credit has tied up their purchasing power to an extent but buyers with spot cash are displaying a more conservative attitude.

Conversion of inventories into cash has been the natural sequence of the banker's attitude and this has had a wholesome influence on industry and trade in general. With the jobber restrained by credit restrictions from cornering any commodity and refused loans until he had disposed of much of his product on hand and with his consequent inability to continue with his purchases until he had conformed with the edicts of the financiers the burden was shifted to the manufacturer, who found himself in much the same position as the jobber. The liquidation of these stocks, while it may result in some hardship through the adjustment of wage and price factors, is admitted as being necessary to the restoring of normal economic conditions.

### Farm Reports Encouraging

Reports from the vast farming districts of this section are encouraging, showing that bins are being cleared of last year's harvest as quickly as possible, though the process naturally is slow. The marketing of this warehoused grain, which is progressing more favorably with an added supply of freight cars to handle it, will release a large amount of frozen credit.

That there are plenty of funds available to move the new crops is the opinion of one prominent banker of Chicago, who says:

"Moving of crops will not require any unusual amount of money this year. It was banking opinion in some quarters several months ago that there was likely to be an extremely tight money situation in the autumn, so large preparations were begun. It now appears that these preparations will be ample."

The accumulation of these surplus funds, however, was more difficult than

in normal years, due to the fact that large amounts of credit were tied up in transportation tie-ups, in the holdover from last year's crops and in the goods left on merchants' shelves.

Much, of course, in the matter of handling the crops depends upon the ability of the railroads to cope with the situation. The tension already has been relieved to a great extent by the withdrawal of freight cars from manufacturing interests and concentrating them in the grain belt. While the manufacturing interests are suffering because of this it is recognized that the crop movement, through adequate facilities afforded it, affects all lines of industry and until the crops have been moved there can be no very appreciable relief in credit conditions. It will take sixty days before the movement has passed, it is the view of bankers here, and for that length of time the money market will continue tight.

The steel trade, always a barometer for industrial conditions, is affected somewhat through difficulties in the way of transportation and fuel, this condition relating more specifically to plants which have sufficient orders on hand to justify large production.

## Imports Into Canada Show Sharp Decline

OTTAWA, ONT., Sept. 4.—The importation of cars valued at less than \$1,000 showed a big decrease in 1919 as compared with the previous year. In 1918 there were 14,373 passenger automobiles in this class, valued at \$8,400,402, and 552 commercial vehicles valued at \$330,036. In 1919 the number of passenger cars under \$1,000 had dropped to 5001 and the value to \$3,326,444. There were 840 motor trucks in the class and their value was \$642,670. In 1918 there were imported 1333 passenger cars, valued at between \$2,000 and \$3,000 whose total value was \$1,803,806, and 232 motor trucks valued at \$313,448. In 1919 passenger automobiles of this class imported numbered 1149 and their value was \$1,413,569, and motor trucks numbered 569, valued at \$800,231.

The number of cars each valued at more than \$3,000 brought in during 1918 was 385 passenger cars valued at \$1,105,008 and 194 motor trucks valued at \$589,976. In the following year 203 passenger cars in this class were imported. Their value was \$586,209. The number of motor trucks over \$3,000 each imported in 1919 was 283, and their value was \$841,947.

The customs duties collected on passenger automobiles in 1918 was \$3,961,035, and the estimated war tax \$848,793.

### DU PONT MOVES TO MOORES

WILMINGTON, DEL., Sept. 6.—The duPont Motors Co., which last year began the manufacture of automobiles in its local plant, has begun moving to its new plant at Moores, on the outskirts of Philadelphia. The plant there has a capacity of 150 cars a month, with room for adding 50 more. The local works will continue to manufacture the engines.

## N.A.C.C. Inaugurates Activities for Fall

### No Discouragement Felt Over Slump in Industry—Prepare for Show Drawings

NEW YORK, Sept. 9.—The National Automobile Chamber of Commerce will begin its fall activities with a rush this week. The vacation season is over and Alfred G. Reeves, general manager, one of the last to get away, returned to his desk last week ready to buckle into an arduous fall and winter. While there has been a sharp decline in automobile output which now is variously estimated to range from 35 to 50 per cent of normal, Reeves is by no means downhearted. He points out that the slump has hit almost every other line of business about as hard and in some cases harder. He has been through other periods of stress and realizes that when the storm is over the industry will emerge stronger than ever.

The first meeting of the week on the N. A. C. C. program was the session of the Motor Truck committee yesterday at which Secretary Fenn made his report. Conditions in the industry were discussed thoroughly and while there has been a marked falling off in demand the members of the committee were by no means discouraged. They could see many favorable omens in the situation.

The directors are in session to-day, taking up routine business which has accumulated during the summer and considering the general situation in the industry. One of the subjects discussed will be the increased freight rates. It is estimated they will add between \$18,000,000 and \$20,000,000 to the annual shipping bill on completed automobiles, to say nothing of increased charges on parts and all kinds of raw materials.

The Motor Truck Sales Managers Association will meet to-morrow and Saturday to discuss sales problems, credits and kindred subjects.

It was announced at the Chamber to-day that drawings for space at the New York and Chicago shows will be held at the headquarters here Thursday, Oct. 7.

### PLANS CANADIAN PLANT

WELLAND, ONT., Sept. 4.—Manufacture of hard rubber goods, plates and cells for batteries, etc., will be undertaken in Welland by Joseph Stokes Rubber Company of Trenton, N. J., which has acquired a three-acre site in that city, adjoining the Grand Trunk Railway. It is proposed to start erection of the rubber factory as soon as material can be placed on the ground. The size of the first unit will be 65 x 160 feet, with a separate power house and office. The railway spur is being laid the entire length of the property, so that shipping facilities will be available to other units as they are added. The company expects to operate by December.



## Special Cables

### Italian Strikers Take Over Plants

#### Strike Takes on Aspect of Revolution—Gasoline Price Rises and Falls

(By Cable to AUTOMOTIVE INDUSTRIES)

PARIS, Sept. 6—The "folded arms" strike in Italy has developed into what amounts to a revolutionary movement, the most menacing in character which has yet developed in that country. Five hundred thousand workers in the metal trades, whose decision to initiate the new kind of strike was recounted in a dispatch to AUTOMOTIVE INDUSTRIES last week, were locked out by their employers. They retaliated by taking possession of the factories in which they worked. They demand wage increases which the factory owners declare are impossible in the present condition of the engineering trades.

The outbreak is much more serious than a mere demand for higher wages, however, for co-operative management of all plants is included in their program. The Reds have seized more than 200 factories in the Milan district alone. This includes the great Fiat automobile works at Turin. The strikers have mounted machine guns on the roofs of the Fiat buildings and are well supplied with munitions. High-tension electric wires have been placed across all the entrances. When the police tried to force an entrance they were met with revolver fire and a shower of bombs. One of the Fiat factories alone employs 10,000 men.

Other automotive plants seized by the radical workers include those of the Ansaldo, Itala, Spa and Lancia companies, the Rhone & Gnome motor works and the Italian Automobile Radiator Co. All the automobile plants in Italy are affected.

#### Factories at Standstill

The Reds have been forced to admit that although they have possession of the factories they cannot operate them because they lack engineers and raw materials. All attempts to obtain raw materials have failed thus far.

The revolutionary movement seems doomed to fail for the reason that the Reds are incapable of operating the factories without trained staffs. The realization of this fact has driven them, in some cases, to attempt the kidnapping of engineers who were carried off to Turin factories and forced to work at the point of revolvers.

Many of the more conservative workers, who have left Turin rather than join

the revolutionary movement, will return when order is restored. The Government has not intervened in the controversy thus far, but is trying to find a solution of the serious situation which confronts the country. The revolutionists assert that unless their demands are granted in the metal trades the movement will be spread to all the industries in the country.

British motorists are alarmed at the sudden and unexpected increase of 7 pence a gallon in the price of gasoline. The rise in price is held to be unjustified and it is held that it will seriously interfere with the movement of freight at a time when more is being handled by motor truck than ever before.

#### France Gets Fuel Supply

The gasoline situation in France has improved. Unlimited supplies are available and the price has dropped about 5 cents a gallon. There is little touring, however, and consumption for this purpose has been materially reduced.

Alldays-Onions have decided, on account of unfavorable taxation and high manufacturing costs, to abandon the construction of the radial engine car which was exhibited at the last London show.

Depression continues in the French market and production has decreased still further and additional workers are being laid off. Citroen, who recently was producing 70 cars a day, has cut the output to 24.

Berliet has received important orders for the repair of rolling stock and his financial difficulties have been overcome. All his October bills will be met.

BRADLEY.

#### ACT ON PURCHASING STANDARDS

NEW YORK, Sept. 7—Final action will be taken by the standardization committee of the National Association of Purchasing Agents on recommendations coming within its jurisdiction at a conference in the Congress Hotel, Chicago, Oct. 10, which will be a preliminary to the convention of the association in the same hotel the day following.

The committee desires to have all suggestions in on that day as the final form for presentation to the general convention will be drafted at the conference. Several trade associations have agreed to have representatives in attendance to discuss phases of the form.

#### CREDITORS ARE SATISFIED

WARREN, OHIO, Sept. 4—Creditors of the Trumbull Tire & Rubber Co. of Newton Falls have decided that the present financial situation of the company is due entirely to the temporary credit stringency. The officers have convinced them that the company is entirely solvent and the creditors will not press their claims at this time.

### Toledo Freighter Takes Export Cargo

#### Overland Ships 492 Cars for Spain and South America via St. Lawrence

TOLEDO, Sept. 4—The Willys-Overland Co. spared the use of more than one solid freight train Saturday, when the "Santa Isabel," a ship constructed by the Toledo Shipbuilding Co. left here with a cargo of 492 Overland automobiles for Europe and South America.

The cars will go to Vigo, Zaragoza, Santander, Valladolid, Corunna, Gijon, Murcia and Granada in Spain, Amsterdam in Holland, and several cities in South America.

The "Santa Isabel" will be followed in September by the "Santa Eulalia," and there are others, that will all load with the Overland cars. The "Santa Isabel" has a length of 270 ft. and a capacity of 3000 deadweight tons.

This sailing is the first significant instance of the new era in lake shipping. The contemplated Great Lakes project within approximately five years will allow 85 per cent of the ocean shipping of the world to navigate the Great Lakes.

The vessels that are now being built by the Toledo ship company are not permitted to load more than 13 ft. 6 in. draft at present, but with the improvement of the St. Lawrence they will be able to take full cargoes.

These ships after disposing of the Overland cars will go into the Cuban sugar trade.

#### BOSCH REDUCES FORCE

SPRINGFIELD, MASS., Sept. 4—The Bosch Magneto Co., according to the admission of officials today, has released a number of employees for an indefinite period from their various local departments and it is not known when they will be reinstated. They deny, however, there is any truth in the rumor that more than 700 men will be affected. "The layoff is neither serious nor sizable," said President Arthur T. Murray, in response to inquiry as to how many employees are to be released. He explained that the order to cut down working forces was given because of a falling off in orders and the unsettled condition of the markets throughout the country.

#### ARGENTINA PLANS EXHIBIT

NEW YORK, Sept. 3—Extensive plans have been made for the exhibition of agricultural machinery among which probably will be cars, trucks and tractors, at Mendoza, Argentina, commencing Nov. 28. The exhibition will be under the auspices of the Andine Rural Society, which has appointed sub-committees to supervise the sections. The scope of this exhibition may be realized from the variety of the various sections, which will comprise live-stock, wines, fruit, dairy produce, and agricultural and industrial machinery.

## Good Roads Gospel Preached in Canada

### Speakers at Representative Automotive Gathering Urge Their Need

TORONTO, Sept. 3—This was Automotive Day at the Canadian National Exhibition and some two hundred of the leading members of the Canadian automotive industry, trade and consumer associations, were present at the directors' luncheon, including Gordon McGregor, president of the Automotive Industries of Canada, G. M. MacWilliam, president Toronto Automobile Trade Association, Sam Rowed, president Ontario Automotive Dealers Association, Dr. P. E. Doolittle, president Canadian Automobile Association, and G. A. Hodgson, president Ontario Motor League. Never in Canada have been gathered together such a comprehensive representation of automotive activities in all their ramifications—production, distribution, merchandising, service and use. Henry Ford was one of the guests of honor.

As a matter of course, the speeches turned largely to the subject of good roads, which bears so important a relation to the motor industry. Especially outstanding in this respect was the address made by Dr. G. Doolittle, who advocated redoubled efforts to secure still greater Government expenditure on road improvement.

After a brief comment on the early stages of the development of the motor car, Dr. Doolittle declared:

"To-day the automobile has passed entirely out of the sportsman stage and has become the most gigantic and the most successful solver of the transportation problem." As proof of this, he cited the invaluable aid furnished by motor cars and motor trucks in solving the transportation problem in England during the recent great railway strike and in this country during the extended period of congestion which followed the war. Continuing, he said:

#### Trucks Come into Own

"In this country, the motor truck is only beginning to come into its own, and the great needs of the immediate future are better highways and byways throughout the length and breadth of the land. The railways of this country have been enormously helped by bonuses and otherwise in their development and maintenance, and our Federal Government up to the present time has expended of public moneys over six hundred million dollars in that direction. To-day the highway transportation is more vital to the country than the railway transportation."

The speaker asserted that towards road construction the Federal Government had contributed \$20,000,000, spread over five years, or \$4,000,000 a year. They were expending \$50,000,000 a year of public money to maintain the railroads

they had acquired, he said, while they gave a paltry \$4,000,000 to the greater system of highways.

This policy, Dr. Doolittle described as absurd, and he urged the automotive industries to join with the Canadian Automobile Association and the various good roads associations of the country in a great movement to impress upon the Government the importance of a great increase in State aid for road betterment. He pointed out that a sum equal to the amount annually collected in Customs dues on motors and motor parts, fifteen million dollars, if devoted to this purpose each year would work a vast improvement.

Another distinguished speaker was Viscount Cave, Chief Advocate of Great Britain, who is on this continent to attend the meetings of the Canadian and American bar associations.

## Economic Calamity Fear Now Passed

(Continued from page 536)

The National Bank of Commerce of Detroit says that "the outstanding feature of this month's report of the general conditions of the country are excellent crop conditions, increasing labor efficiency and somewhat lower average commodity prices on the one hand with declining building operations, decreasing net earnings of railroads, decreasing exports and increasing business failures on the other."

Prof. David Friday of the University of Michigan, one of the country's leading economists, is of the opinion that the crisis has been passed and that there will not be a serious depression this fall. He adds that "one thing is certain and that is that we will never have a money panic." He predicts, however, that financial depression is on the way and that it will reach this country within a few years.

Careful students of the situation as it relates to the automotive industry find no occasion for the increase of pessimism and depression in the past few weeks. The unpleasant situation which now exists was predicted weeks ago and should have been discounted. There seems to be a general revival of interest in truck parts and this interest probably will be followed before the first of the year by actual orders. Many of the parts makers have found considerable new business but are getting less than might have been expected from their old customers. Some of the parts makers were badly over-sold and others fell down on their deliveries.

#### WILL DISSOLVE COMPANY

COLUMBUS, OHIO, Sept. 4—A meeting of the stockholders of the Tractor Power Farming Co. of Columbus has been called for Sept. 16, when steps will be taken for dissolution of the corporation. The company was chartered about four months ago with a capital of \$100,000 to operate tractors for farm work.

## Wrecker Salvages Cars Buried in Sand

### Automobiles Swept Into Bay by Tidal Wave in Good Condition

CORPUS CHRISTI, TEXAS, Sept. 4—Salvaging automobiles from the bed of Nueces Bay, where they were carried by the tidal wave and tropical hurricane that swept over this part of the Gulf Coast region on Sept. 14, 1919, is being successfully accomplished by W. E. Kelly, an expert wrecker. It is not definitely known how many automobiles were buried beneath the water and sand of the bay. Up to this time twenty-seven cars have been salvaged and the search for others is being made.

At the time the great storm struck Corpus Christi the city was filled with visitors, many of whom had made the trip here in automobiles. The tidal wave came with such sudden fury that escape, except in a few instances, was cut off. It is believed that a number of automobiles may have been swept clear across the bay and perhaps buried beneath the sand and their location completely obliterated.

One of the most surprising things about the automobiles that have been recovered is that all but three of them were found in excellent condition, notwithstanding the fact that they lay in the bed of the bay for nearly a year. The sand covered the bodies and the engines seemed to have been protected from the damaging effects of sea water by the sand coverings. The tires upon most of these automobiles were found to be still inflated and the rubber and fabric in good condition. In the case of the three cars that had to be junked after their recovery from the bay it was explained that the damage which they received was by being buffeted in the storm and not from lying in the bay.

#### NEW BATTERY PLANT

MILWAUKEE, WIS., Sept. 3—The Duplex Storage Battery Co. has finally selected Beaver Dam, Wis., as the permanent seat of operations after negotiating several months with numerous other Wisconsin cities. The factory was established in Milwaukee on Jan. 1. By the end of the year its present building must be vacated under condemnation proceedings for bridge construction. At Beaver Dam the former plant of the Beaver Dam Mfg. Co. has been purchased and is now being remodeled and retooled. The capitalization of the Duplex company is being increased from \$60,000 to \$500,000. M. A. Jacobs of Beaver Dam has been elected secretary and treasurer, and J. V. Zweck of the same city is a new director. William Pettschel continues as president and general manager. The company makes a line of storage batteries for motor cars, street cars, telephone and telegraph, farm lighting plants, etc.



## Commission Charges Implement Restraint

### Recommends Action by Department of Justice to Restore Competitive Conditions

(Continued from page 537)

over 85 per cent of the industry, the returns for 1918 as compared with 1916 showed the percentage gain as follows:

"The net sales increased 63 per cent, the cost of sales, 67 per cent, the selling, general, and administrative expenses, 17 per cent, the net operating income from the implement business, 106 per cent, the investment, 1 per cent, while the rate of return on investment in the implement business increased from 9.7 per cent in 1916 to 19.9 per cent in 1918, which is an increase of 105 per cent. The comparison in this case is made between 1916 and 1918 because the rates of profit in both 1914 and 1915 seem to have been unduly low. In 1913 the rate of profit was nearly the same as in 1916, namely, 9.8 per cent; in 1917 it was a little lower than in 1918, namely, 16.6 per cent."

According to the findings of the Commission, the associated manufacturers "repeatedly advanced prices of farm implements by concerted action." This advance was made "under cover of bringing about uniform cost accounting, uniform terms of sale and standardization of product." It is charged that implement trade journals assisted the manufacturers and dealers in maintaining prices.

The Commission reported that farm implements advanced on the average of 73 per cent from 1914 to 1918, due to increased costs of manufacture and expenses of dealers; large increases in profits of both manufacturer and dealer "due in part to price understandings or agreements among manufacturers and to a more limited extent to increase in the profits of dealers." There was no shortage in supply or any unusual demand, the Commission stated.

#### Allege Concert on Prices

Dealers' prices to farmers increased only 62 per cent from 1916 to 1918 as compared with advanced cost of purchase from manufacturers of 82 per cent. The Commission explained this difference that the dealers' increase "expressed in dollars was not greatly different, due to the higher prices upon which their increase was figured."

The Commission charges that concerted action among dealers was obtained through the National Federation of Implement Dealers' Associations with offices at Abilene, Kans., and the Eastern Federation of Farm Machinery Dealers with offices at Philadelphia, assisted by local clubs. These organizations protected their members from competition and increased their profits, the Commission claims, by the following methods:

"Fostered local price agreements between dealers of the same town.

"Induced manufacturers not to sell to dealers who do not maintain prices locally agreed upon.

"Induced manufacturers not to sell to concerns considered as irregular by the dealers, especially co-operative stores and small mail-order concerns.

"By means of so-called cost education they have urged dealers to maintain a high and uniform percentage of gross profit."

The methods used by officers and members of the manufacturers' associations in bringing about concerted price advances and in maintaining prices were as follows:

#### Discussed Proposed Advances

"Price comparison meetings at which advances in prices recently made or intended to be made were discussed.

"Cost comparison meetings at which inflated costs were compared with the tacit understanding that prices would be advanced the same percentage shown by the inflated costs.

"Terms meetings at which agreements were made respecting uniform terms, thus making the prices of the different members more comparable.

"Standardization meetings at which agreements were made respecting the standardization of implements and the equipment to be furnished, thus making the costs and prices of the different members more comparable.

"Frequent exchange of price lists by mail so that members could check up each other's prices, terms, and equipment.

"Frequent exchange by letters of what advances had been made recently and asking for other members' recent price advances.

"Exchange of letters stating what advances were contemplated in the future and when effective and asking for similar data.

"Letters urging low-price members to increase their prices.

"Price tabulation showing in parallel columns the prices of various members, a copy being sent to each member furnishing information for the tabulation.

"Complaints of price cutting, the complaints frequently showing that the price cutting member was held as not keeping faith in maintaining the prices agreed.

#### Members Enforced Rates

"When a branch house or a salesman sold under prices shown in the company's price list, other members frequently wrote the company's main office advising it of the facts.

"By these methods, beginning with meetings held in February, 1916, and continuing through 1918, the manufacturers often arrived at uniform percentages of increase to be applied first to one and then to another line of implements.

"That the officers and members of the manufacturers' associations realized that they were engaged in illegal activities is indicated by the attempted secrecy they sought to throw over all price activities. It is also more directly shown in a number of letters obtained by the Commission."

## Harvester Denies Price Fixing Charge

### No Collusion With Competitors Company Declares—Association Denounces Attack

CHICAGO, Sept. 7.—The International Harvester Co. and the National Implement & Vehicle Association in statements to-day deny that either organization has at any time attempted to fix or maintain prices as charged in the report of the Federal Trade Commission to the Department of Justice.

The Harvester statement, signed by Cyrus H. McCormick, chairman of the board of directors, said in part:

"It should be noted that the report does not find prices or profits in the farm implement industry excessive, exorbitant or unreasonable. The Harvester company has never colluded with any competitor in fixing or maintaining prices."

The association's statement declared the report was "an unwarranted attack on a conservative and vital industry. The commission's figures on profits are sadly misleading. It does not include proper charges against profits, income or excess profits taxes, interest on borrowed money or cash discounts allowed. Figuring in these items, the net profit of farm implement manufacturers was less than 10 per cent on capital stock invested, not counting out paper profits due to advances in unsold inventory. This association has never participated in any price-fixing attempt in the farm implement industry."

#### NEW M'FARLAN MODELS

CONNEERSVILLE, IND., Sept. 4.—Deliveries have begun on two new models of the McFarlan Motor Corp., the type 147 touring and the type 145 sport touring. The chassis has a wheelbase of 140 in. The motor is the McFarlan twin valve type with 4½-in. bore and 6-in. stroke. The twin valves are 1½-in. in diameter, giving a very large valve area.

The motor is equipped with two separate ignition units. The double spark magneto is connected to plugs set on the intake and exhaust sides of the motor and firing across the head. The battery ignition is connected to a single set of plugs set in the intake side.

#### TO TEACH PERSONNEL WORK

NEW YORK, Sept. 4.—The Department of Extension Teaching of Columbia University will offer this fall varied courses in personnel management. They will cover principles involved in planning effective accounting systems and records for present day office and factory management. They are designed to furnish students with a knowledge of standards for conducting personnel departments as well as with an understanding of the business executive's responsibilities.

## Contract Violation Charged to Greene

### Attachment Filed Against Boston Finance Company Promoter

NEW YORK, Sept. 7.—Fresh trouble has developed here for Henry V. Greene of Boston, head of the H. V. Greene Co., and promoter of automobile financing companies which were hard hit by the bankruptcy of the Massachusetts Motors Co., Inc. It came in the form of an attachment for \$505,000 filed against Greene and the Greene company by Mark O. Prentiss of this city for alleged breach of contract to promote the United States Clearing House of Foreign Credits, Inc., which Prentiss planned to organize as an international credit rating bureau. The attachment was served on all the New York offices of the defendant and on its branch in Syracuse.

Two of Greene's Boston companies, the Mutual Finance Corp. and the Commercial Finance Corp., have been taken out of his hands by stockholders' committees because of heavy losses suffered in connection with the failure of Massachusetts Motors, also promoted by Greene. The exact financial situation of these companies has not yet been determined.

Prentiss brought his suit on the ground that 52,500 shares of the stock of the United States Clearing House, which he owned, had become worthless because of Greene's acts and he asks what he considers a fair value for them. He alleges that he proposed to Greene that the Greene corporation sell stock in the projected credit bureau and submitted to him the names of men suitable for officers.

It is asserted by Prentiss that after Greene met these men statements derogatory to the plaintiff were made to them and they resigned from his company to become officers of the Bankers' Union of Foreign Commerce and Finance, which Greene then began to promote and which was based on the same plan as Prentiss' company, with a capitalization of \$10,000,000.

### WILLYS BUYS ST. LOUIS BRANCH

ST. LOUIS, Sept. 6.—A factory branch of Willys-Overland, Inc., Toledo, has been established in St. Louis to displace the Overland Automobile Co., of St. Louis. The change was effective Sept. 1. The following statement regarding the change has been made by Willys-Overland, Inc.:

"A number of years ago the Willys-Overland Co. erected in St. Louis one of the finest sales and service buildings in the country. At that time the Willys-Overland Co. entered into a contract of purchase and sale with the Overland Automobile Co. of St. Louis and with mutual consent are now under that contract purchasing the business. The Overland Automobile Co., of St. Louis,

during the ten years it distributed the Willys-Overland product, handled upward of \$25,000,000 worth of merchandise.

"The corporate officers of the Overland Automobile Co., of St. Louis, are T. L. Hausmann, president; H. D. Condie, vice-president, and W. G. Wallace, secretary and treasurer."

## New Assembled Car Produced in Canada

MONTREAL, CANADA, Sept. 3.—A 6-cylinder car built up of American components has been placed on the market by the recently organized Forster Motor Car & Mfg. Co., Ltd. Among the components may be mentioned a Herschell-Spillman motor, Borg & Beck clutch, Covert three speed transmission, Timken axle, Eisemann magneto, Westinghouse starting and lighting system, and Temme springs. The wheelbase is 125 in. The car has right side drive and is equipped with an irreversible steering gear with 18 in. hand wheel. A Zenith 1 1/4 in. carburetor is fitted, and fuel is fed from a rear tank by the vacuum system. Two and five passenger open bodies, a three passenger coupe, a five passenger sedan and a seven passenger limousine will be furnished. Wood wheels with demountable rims are standard equipment. On domestic orders the tire equipment will be 33 x 4 and on export orders 32 x 4, non-skid being fitted all around.

### INVENTORY OWEN-MAGNETIC

NEW YORK, Sept. 7.—Charles F. Ross of this city and Robert Pennington, vice-president of the Wilmington (Del.) Trust Co., receivers of the Owen-Magnetic Motor Car Corp., are having a careful inventory made of the plant at Wilkes-Barre, Pa., preparatory to a resumption of operations. They are hopeful the plant will be in production again in the near future. The company has enough orders booked to keep it going full blast for months and there are said to have been no cancellations since the receivership. All that it needs is funds to balance the inventory and provide material to turn out completed units. There is reason to believe this money will be forthcoming.

### RED DIAMOND SPEEDS PLANS

ATLANTA, Sept. 4.—Plans are under way for starting construction work soon on the \$1,000,000 assembling plant to be erected at Athens, Ga., by Red Diamond Motors, Inc., to be followed next year by a large factory for the manufacture of the Red Diamond engine. The engine was invented by W. H. Seabrooke and R. E. Hicks, president and vice-president, respectively, of the company. Originally the company was located in Atlanta but as the men directly interested and most of the officials were Athens men it was later decided to build the plant and establish the business at Athens. The company was incorporated recently under the Georgia laws with \$5,000,000 capital.

## Tour Shows Banks Open to Truck Paper

### Dealers Found Slow to Sales Chances—No Need Found for Utility Propaganda

(Continued from page 537)

While the territory has many dealers who have failed to grasp the opportunity which is theirs, there are many others who are fully alive to the possibilities. They are the ones who sell not only passenger cars but trucks, tractors, lighting plants and all kinds of power machinery. These men are wonderfully prosperous for most of the farmers have plenty of money or will have when their crops are sold.

The farmers don't need to be sold on the truck. They know all about it and the only thing they have to be shown is that it will make money for them. Once convinced of that they will buy. The sizes they like range from 1 1/2 to 2 1/2 tons and they insist upon pneumatic tires for good roads constitute the crying need of this section. With all their prosperity, these states have been backward in highway building. Northwest Missouri is worse off in this respect.

While the banks are not financing sales of passenger cars it must not be assumed there is no market for them in this territory. There are many prosperous farmers who are buying for cash and they are getting more expensive cars each year. Thousands of them are driving Paige-Detroits, Hudsons, Nashes, Hupps and there are many Cadillacs to be seen.

Inadequate railroad transportation is slowing up the financing of the crops. Much of that grown last year is still in the warehouses. To meet this condition bankers are urging the purchase of trucks so grain can be hauled to distant elevators which will be able to receive it.

If the manufacturers get after the dealers and the dealers get after the prospects the banks will finance all the legitimate sales which can be made and there is almost no limit to the market.

### ENGINEERS AT RIVER ROUGE

CLEVELAND, Sept. 3.—Three hundred members of the Cleveland Engineering Society inspected the Ford River Rouge blast furnaces as the guests of the Detroit Engineering Society this week. Following the inspection the visitors were taken to the Board of Commerce rooms in Detroit where they were entertained at luncheon and taken for an automobile tour of the city.

### LLOYDS AVIATION RECORD

NEW YORK, Sept. 3.—Information has been received from London that Lloyds soon will establish Lloyds Aviation Record, which will provide for aviators, aircraft owners and constructors facilities corresponding to those available for sea captains, ship owners and ship builders.



## Chamber Gets Wind of New Tax Attempt

### Move to Assess Sales Tax on Retail Price Watched for Developments

NEW YORK, Sept. 9.—An attempt to impose an added tax on the automobile industry was reported at a meeting of the Motor Truck committee of the National Automobile Chamber of Commerce here yesterday. So far as known only one truck manufacturer has been affected thus far and the committee members were in doubt whether it marked an isolated attempt by an internal revenue collector to increase the returns from his district or whether it was the beginning of a concerted movement. In any event it was viewed with considerable apprehension.

The manufacturer in question has been informed by the revenue collector in his district that when he gives a dealer exclusive rights in any particular territory the sales tax must be paid on the retail instead of the wholesale price. This is a reversion to an interpretation which was placed upon the law three years ago but which was abandoned upon the earnest representation of the automotive industry. If carried into general effect it will mean an added burden of about 20 per cent not only upon automobile manufacturers but upon all manufacturers who assign exclusive sales territory.

Under the interpretation of the law made three years ago, when a manufacturer does both a wholesale and a retail business the tax is applied on the wholesale price. Now the energetic collector declares that when a manufacturer has a dealer in Los Angeles, for example, and a branch in San Francisco, with the agreement that neither can invade the sales territory of the other, the manufacturer controls sales absolutely through his contracts and that, therefore, he must pay a tax on whatever the dealer or branch gets for the vehicle sold.

#### Tax on Corporation Return

The contention of the N. A. C. C. is that a manufacturer should be taxed on what he gets for his vehicles as a corporation. A protest has been made by the manufacturer involved to the Treasury Department in Washington and he is being backed by the Chamber.

In this particular case the revenue collector contends that Article 34 of Regulation 47 is for the protection of the wholesaling manufacturer who is also a retailer in his right to compute the tax on the basis given to manufacturers engaged only in wholesaling their products and that it should not give him any added privileges by reason of his retail business. "It must be borne in mind," he says, "that this is a manufacturers' tax and that no class of manufacturers may be allowed an advantage over another in computing it. 'Customarily sells

such articles at both wholesale and retail' is construed by us to mean that the manufacturer selling at retail is not given the right to eliminate other dealers in specified and restricted territories in order that he may reap the benefit through his own or an agent's retail stores. If he sells in any territory at retail he must not refuse to sell at wholesale to those who wish to purchase his manufactured products for resale in the same territory. Only a manufacturer who holds himself out to be a wholesaler and retailer and who does business as such impartially to the trade in all territories should be entitled to compute the tax upon the goods sold at retail on the price for which like articles are sold by him at wholesale."

#### Not Enthused by Outlook

The truck committee considered the conditions in the trade and were not especially enthusiastic over the outlook. Secretary F. W. Fenn reported what he found on a trip through Oklahoma, Missouri and Kansas to investigate the credit situation and stated that the situation in that territory was distinctly encouraging. If there is any lack of credit it is the fault of the dealer rather than the banker.

It was announced that John J. Puleyn, president of the New York Savings Association, will present the case of the motor truck as a unit of transportation at the meeting of the American Bankers' Association in October.

Fenn reported that managers of farm bureaus in western New York, representing 50,000 farmers, are much interested in the co-operative use of motor trucks and will take the question up this winter. The counties concerned are Chautauqua, Cattaraugus, Orleans and Niagara.

## Texas Speculators Reaping Big Profits

LUBBOCK, TEX., Sept. 4.—Buying automobiles of dealers in New Mexico, driving them to Texas and selling them at profits ranging from \$100 to \$200 each has become quite an industry recently. In the section around Lubbock a number of men are engaged in this industry. It is found that the dealers of many towns of New Mexico are well stocked with automobiles, particularly of the cheaper variety, while the demand in Texas far exceeds the supply.

It is an easy matter for a speculator to purchase two or three automobiles in the neighboring State, bring them overland to points in the interior of Texas and sell them on sight at good profit.

Recently a ranch foreman near Lubbock purchased three cheap cars in New Mexico, drove them to Sweetwater, Tex., and sold them upon arrival at \$100 each more than he paid for them. This transaction so pleased the ranch foreman that he returned at once to New Mexico for another supply of cars. It is only one of many instances of similar transactions.

## Hold Final Meeting On Merger Details

### Financing Program of Maxwell-Chalmers Scheduled for Adoption—Stock Sale Assured

NEW YORK, Sept. 9.—What is confidently expected to be the final meeting to work out the reorganization of the Maxwell and Chalmers companies will be held in this city at 3 p. m. to-day. All the interests involved will be represented at the meeting and there is every reason to believe that the plan which has been worked out will be adopted. This provides for a new company with new issues of securities.

It is understood the present stockholders of the two corporations have underwritten this new stock to such an extent that virtually \$15,000,000 in cash will be provided. In addition to this sum, it is authoritatively reported the banks have agreed to accept notes for another \$15,000,000 maturing in one, two and three years. These notes would be paid out of the potential profits of the company and would retire the \$12,500,000 revolving fund now outstanding.

Details of the organization of the new company have not been announced, but they are fairly well understood in financial circles. There are to be two classes of stock in the new company, class "A" and class "B." The number of shares of the former has been placed at 150,000 and of the latter at something over 600,000. The basis for the exchange of stock, it is reported, will be 50 per cent of class "B" stock of the new company for Maxwell first preferred, 25 per cent of class "B" for Maxwell second preferred, and 10 per cent of class "B" for Maxwell common.

The preferred stock of the Chalmers company would receive 60 per cent in class "B" stock and the common a round 10 per cent. The class "A" stock will be offered at par, with a bonus of 2½ shares of class "B" stock for each share of class "A" purchased. It is expected some of the stock will be reserved for public subscription.

#### Will Assure Business Future

This plan of refinancing, if it goes through, as there is every reason to believe it will, will provide adequate working capital to put the Maxwell company, lessee of the Chalmers plant, on its feet and assure a prosperous future business. The main difficulty up to the present has been lack of ready cash to carry the company, especially with conditions as they now are. There has been no lack of business and the profits have been entirely satisfactory, but they have been consumed by the heavy bank carrying charges.

Early announcement is expected of changes in the management of the company. It is understood this question will give little concern once the refinancing is out of the way and the new company is ready to operate.

## British Makers Bar Imported Tractors

### American and Canadian Products Ruled Out of Royal Agricultural Society Trials

LONDON, Aug. 26 (*Special Correspondence*)—"A rift in the lute" has occurred in connection with the forthcoming tractor trials promoted by the Royal Agricultural Society of England, associated with the Society of Motor Manufacturers & Traders, Ltd.

When the trials were settled upon and entries invited by the R. A. S. E. (the S. M. M. & T. at the outset not being associated) there was no indication that American plows, cultivators, etc., were to be excluded. One company duly entered, believing that they would be able as heretofore to demonstrate their tractors and implements and take orders accordingly.

Afterward it was decided to ballot for certain plows to be used exclusively by all competitors. This decision was resented by this tractor and implement entrant, and the protest was duly lodged with the R. A. S. E. committee. No reply was received, but shortly afterward they learned that the ballot had been taken, and that imported (American and Canadian) implements had been ruled out by the ballot, thereby limiting the selection to British makes.

The company referred to interpreted this one-sided action as logically leading up to a ban of imported tractors, a step which cannot be taken now because of the backward state of the home manufacture of tractors, and the prohibitive price of the bulk of them. Accordingly they have canceled their entry and the demonstration looks like being relegated to a purely British one with no claim to being considered international and competitive. It may be added as some explanation of the ban, that about 60 per cent of the implements concerned are imported. Blame for this one-sided action is charged to a small party of British plow makers, some of them well known as protectionists.

### ACE CAR SHOWN AT FAIR

DETROIT, Sept. 7—O. W. Heinz, general manager of the Apex Motor Corp. at Ypsilanti, is in Detroit this week showing one of the Ace touring models at the State Fair. The Apex corporation started manufacturing operations several months ago and now is producing several cars a day. A new building is being erected on the factory site, with the completion of which a production of 50 cars a day is planned.

### EXPORTS UP TO JULY

WASHINGTON, Sept. 4—Exports of American goods increased \$23,000,000 in value in July, as compared with June. The report of the Bureau of Foreign and Domestic Commerce issued to-day

showed the July exports were valued at \$654,000,000, as compared with \$569,000,000 for the same period last year. The total value of exports for the seven months period ended July, 1920, amounted to \$4,902,000,000, representing an increase of 6 per cent over the corresponding period in 1919. Imports fell off from \$553,000,000 in June to \$537,000,000 in July. The balance of trade is indicated in the \$117,000,000 excess in exports in July and \$1,420,000,000 for the seven months ended July, 1920.

## Ford Thinks Politics Causes Irish Trouble

TORONTO, ONT., Sept. 3—Henry Ford of Detroit paid his first visit to the Canadian National Exhibition this week. He was accompanied by E. G. Liabold, W. B. Campbell and G. McGregor, Canadian manager for the Ford interests. Regarding production at the Ford factory here, Ford intimated that it was his intention to keep all his men employed to increase production. "It is the only way to prevent a slump," he said.

Work at the company's Irish factories, he said, was splendid, between 200 and 300 tractors being turned out each week at Cork.

"So far as we are concerned," he added, "there is not a particle of trouble in Ireland in our works. The only trouble in Ireland is caused by politicians."

## Trailer Manufacturers Report New Orders

CLEVELAND, Sept. 7—Reports at a meeting here of the Trailer Manufacturers' Association of America show that there are still a large number of unfilled orders on the books of members and that new orders have begun to come in after a temporary lull. Foreign orders, it was reported, are coming in at a good rate.

The movement to reduce the number of trailer models has gained considerable headway, one maker alone being reported as cutting his number from 48 to 12 in the past year. A committee was appointed to investigate the feasibility of standardizing axle dimensions and also to report on a standard pintle hook.

Wentworth & Irwin, Portland, Ore., and the Reliance Trailer & Truck Co., San Francisco, were admitted to membership. Initiation fees and annual dues of the association will be doubled Jan. 1.

### SYDNEY BUILDS FIRE TRUCKS

WASHINGTON, Sept. 3—Motor fire engines have been built by the municipal authorities of Sydney, Australia, according to advices received from American consular agents to-day. The engines were manufactured for \$2400 less than London quotations. The shipping situation which made it impossible to import engines is responsible for the development of a municipal enterprise. Twelve fire engines are produced annually in the Sydney factories equipped with pumps lifting 300 gal. per minute.

## Olympia to Show Many New Models

### American Cars Numerous, Several Being Shown for First Time in England

LONDON, Aug. 24 (*Special Correspondence*)—The Society of Motor Manufacturers & Traders, Ltd., will hold its annual car show—the fourteenth of the series—from Nov. 4 to 13, inclusive, concurrently at Olympia and the White City. There will be nearly 100 car exhibitors at the former and nearly 80 at the latter, and the total exhibitors in all sections will be 500, if not more.

Of the 97 at Olympia the Bleriot-Whippet, made by the French airplane manufacturers; the Galloway, a product of T. C. Pullinger of the Arrol-Johnston Co.; the Grant, an American car new to this country; the Ceriano, Messrs. Newton & Bennett; the Nash; the Zebre, a new French car, and the Leyland will appear for the first time.

At the White City the Argyll car will be seen again after a long interval, and the new exhibits will include the Owen-Magnetic; the Cluley, a Coventry-made vehicle; the Hudswell, a Leeds firm's exhibit; the Forster, a new Canadian production; the National and the Winton Six; the Unit No. 1, a friction-driven small car; the R. L. C., Argyll (London) Motor Engineering Co., Ltd.; the Ryner-Wilson, a new English make; the Zeiler, which comes fresh from France; the Milburn Electric, Carter Electric, the Allen, the A. L. P., the Alvis, the Bethlehem, Emscote, Vandy, and Westwood.

### DEVISE AIR NOMENCLATURE

WASHINGTON, Sept. 3—The National Advisory Committee for Aeronautics has distributed copies of Report No. 91, which contains nomenclature and list of symbols approved by the executive committee last spring. The report has been sent to aircraft manufacturers and engineers in an effort to secure uniformity in terms used in Government and technical publications. The report was prepared under the direction of the subcommittee on aerodynamics, assisted by the Interdepartmental Conference on Aeronautical Nomenclature and Symbols. The stability terms and power-plant terms were given special consideration.

### AIRCRAFT DUTY REDUCED

NEW YORK, Sept. 3—As an incentive to further commercial development of the airplane within its borders, the government of India has reduced the import tariff on airplanes, airplane engines, and parts from 7½ to 2½ per cent ad valorem. This decree, according to information reaching here, was made about two months ago. Additional concessions will permit the passage across India without duty of planes from other countries. This clause was added to the decree in a desire to promote long-distance flights.



## Cars Not Piling Up in Atlanta District

### Investigation Shows Only Small Number Held Up Through Money Shortage

ATLANTA, Sept. 7—Reports that thousands of automobiles are piling up in the Atlanta district because of dealers' inability to handle them are without foundation. A careful investigation discloses that not more than 100 automobiles have been held in the cars in which they were shipped because the men to whom they were consigned could not finance them. The Chamber of Commerce found, when the report first became current, that there were only 23 carloads of motor cars in the city and the only reason they had not been unloaded was that facilities were not immediately available.

Inquiries among dealers show that the only cars refused by them were shipments sent on by the factories when they had not been ordered. One company turned back 100 cars which belonged in this category. Most of the dealers assert they are not having extraordinary difficulty in financing themselves and that they are doing a reasonably good business. Conditions have improved in the past few weeks.

### Premier to Issue New Five Year Notes

INDIANAPOLIS, Sept. 7—Holders of the five-year 6 per cent notes of the Premier Motor Corp. which mature Nov. 1 have been asked to exchange their holdings for another issue of 7 per cent notes running for five years. The management of the company admits that it has no funds to meet the maturing issue. Noteholders have been told that unless they accept the proposition made to them they will have to take over the collateral, which consists of the common and preferred stock of the Premier Motor Corp. of Delaware, which was taken over by the present company, a New York corporation, in 1918.

The gold notes, which constitute the funded debt, were dated Nov. 1, 1916. The total of the issue was \$562,000. The company was obligated to redeem by lot at par \$125,000 of the notes on Nov. 1 last, \$187,500 on Nov. 1 next, and the remainder Nov. 1, 1921.

Some new capital was brought into the company some time ago and it is believed that if arrangements can be made to care for the notes the company will be able to continue the operation of its plant at Indianapolis, for it is said to have plenty of orders on its books.

### DIRECTORS REMOVE PRESIDENT

ARLINGTON, N. J., Sept. 8—Directors of the Automobile Leather Mfg. Co., makers of fan belts, belting and automotive leather products, have adopted a

resolution removing Lincoln T. Kauffmann from the presidency as well as all other connection with the corporation. An announcement by the company says:

"The directors regretted that they were obliged to take this action but after carefully considering the matter they concluded it was their duty to do so in order to conserve the best interests of the company and its business associates."

### General Motors Shows Increase in Quarter

NEW YORK, Sept. 9—The balance sheet of the General Motors Corp. as of June 30, last, makes the following showing:

Assets—	June 30, '20	Mar. 31, '20
Real est., pl. eqp. ....	\$191,025,327	\$173,693,622
Investments ...	62,412,840	58,477,657
Cash .....	48,400,460	55,667,642
U. S. Gov. bds. ....	197,468	202,469
Mktble secur. ....	56,475	986,774
Due from Gov. ....		232,100
Drafts .....	15,391,507	16,218,619
Notes & accts. rec. ....	36,689,221	36,533,045
Inventories ....	184,779,598	157,981,211
Deferred exp. ....	5,844,074	4,544,555
Gdwl. pat., etc. ....	22,670,672	22,662,626
Total .....	\$567,467,642	\$527,210,320
Liabilities		
Deb. 7% stk. ....	\$25,153,500	\$26,926,600
Deb. 6% stk. ....	56,371,100	56,441,100
Pfd. 6% stk. ....	16,183,400	16,186,000
Com. stk. (no par) .....	\$161,289,180	\$111,171,770
Com. with par. ....	7,145,700	153,411,000
Pur. mon. bds. ....	71,020	73,000
Pur. mon. nts., acct. Fisher Body Corp. ....	15,840,000	18,840,000
Cap. stk. & surp. of subsidiaries not owned by Gen. Motors. ....	1,896,258	1,696,862
Accts. pay. ....	36,440,740	37,815,526
Notes pay. ....	78,257,898	49,004,530
Taxes, payr. & subsid. acer. not due .....	21,048,266	19,231,872
Reserves .....	49,137,993	43,868,622
Surplus .....	98,632,587	92,543,438
Total .....	\$567,467,642	\$527,210,320
+15,366,400 shares. +354,659 shares.		

### TOWER INCREASES CAPITAL

GREENVILLE, MICH., Sept. 7—The fourth annual meeting of the stockholders of the Tower Motor Truck Co., held here, was attended by the largest number of stockholders ever present. In addition to the regular business, including the election of a board of directors, it was voted to increase the capital stock from \$500,000 to \$2,500,000.

Material is being assembled for an addition to the buildings, which will be 60 x 100 ft.

### AKRON FORCE CUT 50,000

AKRON, Sept. 8—The wholesale reductions in the working forces of the 22 tire manufacturing companies in this city have now aggregated 50,000. The latest cut has been in the publicity department of the Goodyear Tire & Rubber Co., which has dismissed most of its staff.

## Seek Quick Action on Standard Parts

### Creditors and Stockholders Meet to Outline Refinancing Plans —Receivers Work Plant

CLEVELAND, Sept. 9—The committees representing the creditors, common and preferred stockholders of the Standard Parts Co. will meet here tomorrow to outline a plan for refinancing the company. It is hoped the various interests involved can be brought together promptly and that an early agreement can be reached. The receivers have been authorized to issue receivers' certificates to keep the plants in operation but the company will suffer serious loss if the receivership cannot be lifted soon.

The creditors, both bank and merchandise, have shown a disposition to co-operate so far as they can reasonably and opportunity will be given for careful consideration of the subject. It is not considered probable that the original refinancing plan contemplated by J. O. Eaton and his associates will be accepted by the committees. It was this proposal which resulted in the receivership as the outcome of suits filed by L. H. Perlman of New York. Perlman has declined to serve on the stockholders' committee.

### MARVEL CAPITAL NOW \$500,000

COLUMBUS, Sept. 8—Papers have been filed increasing the authorized capital of the Marvel Tractor Co., of Columbus from \$35,000 to \$500,000. The company has offices in the Dispatch Annex Bldg., and has completed one model which was exhibited at the Ohio State Fair. It is now planned to erect a factory for the manufacture of the tractors on a large scale. The location of the factory has not yet been decided on but probably will be in some small city in central Ohio.

The tractor is designed for general farm work and has a 25 hp. motor, placed under the frame, close to the rear wheels. This is designed to give an absolute square turn and to give additional power. It has a 31-inch clearance for cultivation. The Nutt-All transmission is used and the final transmission is by rolling chain. While prices have not yet been fixed it will be in the neighborhood of \$1500.

The additional stock of \$465,000 is all of the common issue. The sum of \$35,000 has been used for experimentation. The chief engineer is E. R. Wheeler, formerly of the Sun Tractor Co., of Cincinnati. Thomas J. Benson is president; Norman D. Beglin, secretary, and J. M. Sheets, treasurer.

### GARFORD ADDS TO PLANT

LIMA, OHIO, Sept. 7—The Garford Motor Truck Co. has awarded a contract for the erection of a \$250,000 office building, which will be built during the fall. The company also contemplates a number of additions to its plant.

## Canada Develops Vast Tire Industry

**Decade Shows Phenomenal  
Production Growth—Domestic  
and Foreign Trade Large**

TORONTO, Sept. 4—The Canadian automobile tire industry is a development of the past decade. In 1910 Canada's entire production of automobile tires did not amount to more than 12,000 tires in twelve months. There were only two factories operating. To-day there are fifty-three, nine of which are nationally known. They are located in Ontario.

The automobile tire has taken a leading place among the rubber products manufactured in this country. The automobile tire industry has become one of Canada's most progressive and important enterprises. The nine large tire factories in Ontario employ thousands of men in the manufacture of automobile tires, and two other factories are in course of construction, one to cost \$5,000,000, the other \$2,000,000. Each working day these are turning out some 9000 completed automobile tires. One factory alone at New Toronto last year produced 3000 per diem. They are expecting to double this production during the current year. In 1920 all Canada's tire factories combined will produce about 3,000,000 automobile tires. This will be an increase of about 40 per cent over last year.

The rapid growth of the automobile tire industry must be attributed to the practical use of the automobile. Demand for automobile tires will always be in direct ratio to the production and use of automobiles. It has been computed that every automobile during its life consumes its original cost in tires, inner tubes and various tire accessories. In 1910 there were only 8937 automobiles in all Canada. At the beginning of the present year the different Provincial Governments reported a total of over 335,000 passenger and freight motor cars registered. By the end of 1920 it is estimated by the Automotive Industries of Canada that there will be over 400,000 cars in the Dominion.

### Further Expansion Seen

The popularity of the motor-driven vehicle for passenger and freight transportation in Canada shows no signs of waning. The automobile's development has been based on its value as an economical and rapid means of transportation. Therefore, there is every indication that its use both for passenger and freight carrying service will increase, which in the natural course of events must create a still greater market for the automobile tire.

How much the motor tire industry has added to Canada's industrial development and to what extent it has benefitted the country may be glimpsed from the fact that at the first of the year between

seven and eight thousand men and women were employed in Canadian tire factories at uniformly high wages. The combined pay-rolls of the tire factories and tire distributing units was not less than \$10,000,000.

### Freights Increase Prices

This wealth has been kept at home because Canadian automobile owners have supported the home industry by buying Canadian made tires, rather than imported brands. This has been an inspiration to the tire manufacturers to maintain a high standard of quality in their product. The quality of Canadian made tires is said to be second to none in the world. Considerable improvement has been made in the construction in Canada of automobile tires, and to-day although the price of the automobile tire is higher than it was a few years ago, the cost per mile is much lower because of the greater tire mileage obtained.

One contributing factor to the slightly higher prices for automobile tires prevailing in Canada as compared with the United States is the geographical difference between the two countries and the sparsely settled character of many parts of Canada. It is necessary here for salesmen to travel long distances between centers of population with abnormally long freight hauls such as is found between old Ontario and Winnipeg. This must naturally add much to the cost of distribution and the price the ultimate consumer must pay.

Evidence of the regard in which Canadian-made automobile tires are held is found in the growth of the export trade of Canadian tire manufacturers. During the eight months ending Nov. 30, 1919, tires to the value of \$3,768,389 were exported from Canada. Almost every country in the world where the automobile is used received its quota of this Canadian-made product.

World markets are open to Canadian automobile tires. Practically every Canadian tire manufacturer is bidding for export business and the prospects are bright. Export trade in automobile tires from Canada during 1920 will almost double that of last year.

### Popular with Home Trade

The support of Canadian car owners along with the demand for Canadian-made automobile tires in the foreign market has permitted greatly increased production. Manufacturing costs have been kept down to the minimum, until to-day the selling price of Canadian-made automobile tires is only 7 to 15 per cent higher in price than tires of corresponding quality in the United States. This in face of the import duty on cotton, coal and machinery which the Canadian tire manufacturers use.

Prospects for the coming year are very favorable as far as demand is concerned. Canadian tire manufacturers are certain of finding a market for their tire production in the domestic and export fields. Production in some tire factories, however, may be curtailed because of the difficulty of securing adequate supplies of materials.

## Caproni Establishes Plane Wreck Cause

**Investigation of August, 1919,  
Disaster Lays Blame to Weak  
Flooring**

PARIS, Sept. 1 (*Special Correspondence*)—After a very close inquiry carried out by the Caproni Co. and the Italian military authorities, the cause of the disaster on Aug. 2, 1919, to the big Caproni triplane appears to have been discovered. This plane broke up in the air, killing seven Italian newspaper men, seven mechanicians and two pilots. It was the worst accident recorded in the history of heavier than air machines.

The central fuselage of the Caproni had a compartment placed just in front of the engine, originally designed to receive clothing and light baggage. As it was not intended that this compartment should receive heavy loads, the floor was built very light. For the flight on Aug. 2 the lockers were taken out of this compartment and two seats fitted for the passengers, without the precaution being taken of strengthening the floor. It is now practically certain that while in the air the floor gave way, allowing the two journalists to fall through. In their fall the two men were caught by the rear propeller and received such injuries that they probably were killed immediately. Pieces of broken propeller tore the wings and also probably cut off the tail of the machine, thus causing its fall.

This theory is substantiated by the fact that two of the bodies of the victims were found a considerable distance from the wreckage of the airplane, and they bore traces of injuries which could only have been inflicted by a propeller. As a test, three army planes identical with the wrecked machine were selected at hazard, and, after the lockers had been removed from the rear compartment, two persons occupied these positions—the machine naturally remaining on the ground. In all three cases the floor gave way and the passengers dropped through after a few movements had been made.

## Ford Plans to Stage Own Farm Power Fair

DETROIT, Sept. 4—Henry Ford has planned an innovation for State Fair visitors at his farm. An invitation has been extended to fair visitors to come to the farm and witness a demonstration of farm machinery. Ford will show the visitors how the ground is ploughed with the tractor. Another demonstration will show wheat being cut and threshed, sent to the mills, ground into flour, hauled to the bakery and baked in the presence of visitors by machinery. The only time when machinery will not be used in the demonstration will be in feeding the bread, biscuits, etc., to the visitors as soon as it leaves the oven.



## INDUSTRIAL NOTES

**Valley Electric Co.,** St. Louis, which recently purchased the St. Louis Electrical Works, has begun moving into its new buildings on South Kingshighway. Offices and automotive departments are in the new location, but all engine manufacturing is being carried out at the old plant. The new buildings will be devoted to the manufacture of smaller engines and the old buildings to the larger ones.

**Lycoming Motors Corp.,** Williamsport, Pa., has laid off between 600 and 700 men because of business conditions in the Middle West, which have influenced the automotive industry. The employees will not be taken back until conditions improve. The plant will be operated hereafter on one shift instead of two.

**Rub-Tex Co.,** of Indianapolis, has bought the plant of the Everwear Rubber Co. of Milwaukee, and the machinery and plant equipment will be moved to the Indianapolis plant. The purchase price is reported to have been \$100,000.

**United States Rubber Co.** has started operations in its new factory at Hartford, employing three shifts. It will be devoted exclusively to the manufacture of cord tires. There is a total manufacturing space of 278,000 sq. ft.

**Puritan Rubber Co., Inc.,** Yakima, Wash., has begun the erection of a \$500,000 factory to manufacture "Pathfinder" tires and tubes and mechanical rubber goods.

**Kearns-Dughe Motors Co.,** Beavertown, Pa., has moved its plant and main offices to Danville, Pa.

## SAMSON ADDS IMPLEMENT PLANT

**CHICAGO, Sept. 7**—A site for a new implement plant has been selected by the Samson Tractor Co., Janesville, Wis., adjoining its new tractor plant. This addition, when completed, will provide facilities necessary to take care of the demand for Samson horse drawn implements. This line was formerly manufactured by the Janesville Machine Co., which was taken over by the Samson company at the time of its establishment. The line includes plows, listers, corn and cotton planters, disk harrows, lever harrows, weedeers, seeding attachments and other such implements.

## BUILDING POWER PLANT

**MUSKEGON, MICH., Sept. 4**—In order to take care of the greatly increased manufacturing facilities at its Muskegon works, the Continental Motors Corp. is erecting a power plant which will be in operation by Jan. 1. It will make the company independent of the local supply. The plant is being built on land reclaimed from Lake Michigan. Continental Motors produces at Muskegon all its 4-cylinder truck motors as well as all the foundry and drop-forging work for both the Detroit and Muskegon plants.

## UNSKILLED LABOR SURPLUS

**GRAND RAPIDS, MICH., Sept. 4**—Unskilled labor is plentiful in Grand Rapids and while there still is a strong demand for skilled workers there is said to be a corresponding slump in the num-

ber of jobs available to unskilled laborers. Arrival of building material, however, is expected to bring about readjustment of conditions and the unskilled labor laid off in automotive and other factories is expected to be absorbed in the building trades. Despite the slump, wages have not been affected, remaining at about the old scale of 60 to 65 cents an hour for unskilled labor.

Wills-Lee Company Moves  
Experimental Equipment

**DETROIT, Sept. 2**—General offices of the Wills-Lee Co. in the Book Building here closed to-day and practically all of the officials will in the future be housed in a portion of the new plant in Marysville. A few officials will remain in Detroit and will have headquarters at the plant of the DePalma Mfg. Co. on Woodbridge Street, pending the closing of some local business.

The purchasing department has been moved to the DePalma offices. A shipment of the machinery and equipment of the DePalma plant was sent to Marysville a week ago and has been installed in the Wills-Lee factory. The machinery and plant of the DePalma Co. had been used by C. Harold Wills for the conduct of experimental tests.

With the opening of offices in Marysville the company expects immediately to begin production on the new car, a description of which is promised shortly.

La France Employees  
Granted Stock Request

**ELMIRA, N. Y., Sept. 7**—American La France Fire Engine Co. will issue \$1,000,000 in preferred stock, all of which will be offered for sale to employees of the company. The capital increase was approved by stockholders following a request from the shop committee of employees in which they asked that the company offer stock to them on the same terms which governed their purchase of \$400,000 in Liberty bonds.

Requests for subscriptions to the new stock indicate that within two years nearly \$500,000 of the new stock will have been fully paid for by the workers, with fully 75 per cent of all employees becoming stockholders. The plan limits the purchase by any one employee to 30 shares and employees draw a premium dividend, above the regular rate of 3 per cent a year.

## TEXAS EXTENDS HIGHWAYS

**AUSTIN, TEXAS, Sept. 6**—During the years of 1917, 1918, 1919 and 1920, Federal aid to the total amount of \$16,091,404.17 was apportioned to the State of Texas for the construction of highways, according to a statement by Rollin J. Windrow, State highway engineer. The highway construction program for this State, as mapped out by the State Highway Department, is more extensive at this time than ever before and will call for still larger Federal apportionments.

## METAL MARKETS

**A** NUMBER of foundries in the automotive industries have turned sellers of pig iron, especially so in the Chicago district. This unusual symptom should help in accelerating the breaking of the deadlock that now prevails in the pig iron market. In the market for finished steel which has slowed down to the point of somnolence, the chief topic continues to be the United States Steel Corp.'s determination to adhere to its old prices. This, so independents declare, will cost the corporation the neat little sum of \$50,000,000 a year, this being the amount of the increased freight rates which it will have to pay on its raw materials. In the first place, however, this computation is not quite true to the facts because on all material that the corporation sells on a Pittsburgh basis and which is delivered from a mill having a lower rate to the point of destination than the rate from Pittsburgh to that point, the corporation is the gainer through the advance in freight rates. In the second place, any advance the corporation might make in its prices at this time would not only apply to the more than 10,000,000 tons now on its books and constituting its probable output until July 1, 1921. The truth of the matter is that the corporation's decision not to alter its prices is now for the first time beginning to hurt the independents. Heretofore the demand for their production was so intensive that no one paused to compare their prices with those of the corporation. Conditions have changed and even automotive purchasing agents, heretofore considered ready to pay any price asked, are beginning to make uncomplimentary remarks about the spread between the quotations of the independents and those of the corporation.

**Pig Iron.**—Quotations are unchanged, but represent solely asking prices. There are no sales to automotive consumers at the \$50 level for No. 2 foundry.

**Steel.**—Manufacturers of cold rolled strip and other cold finished steel in the Pittsburgh district report having received a number of requests from automotive consumers to hold shipments in abeyance for a month or two. The disposition among makers of cold finished steel bars is to accede to these requests for a reasonable postponement, but when producers have an opportunity to apply such tonnages to orders from agricultural implement makers they ask automotive buyers to cancel. These cases, however, are the rare exception. The market for both cold and hot rolled strip steel is soft at 8½c. and 5½c., respectively, Pittsburgh. The tendency of the billet and sheet bar market is easy. Automotive sheet demand is quiet. Bolts and nuts, as repeatedly indicated in our market reports, have advanced at several centers, but the automotive industry is not buying at this time.

**Aluminum.**—Foreign metal continues to be offered at 2c. and 3c. below the sole American producer's quotations, but there is no buying of either 98 to 99 per cent pure ingots or No. 12 alloy at this time. Neither is there much American virgin metal available in the resale market, showing that automotive consumers are holding their reserves. Sheets are fairly active and firm.

**Lead.**—Downward revision in the quotation of the leading producing interest is momentarily looked for by the trade.

**Zinc.**—American zinc is being shipped back here from England and laid down cheaper at Eastern consuming centers than metal brought from the Southwest. The London market is 1½c. below ours.

## Automotive Financial Notes

**Republic Motor Truck Co.**—Report for the six months ended June 30 shows net earnings before Federal taxes of \$1,741,618 as compared with \$188,751 in the same period last year. The report shows notes and accounts receivable of \$1,226,610, cash of \$1,162,964 and inventories of \$6,781,561. The liabilities include: Purchase money obligations, \$3,089,281; notes and accounts payable, \$1,873,826; accrued liabilities, \$284,970; miscellaneous current liabilities, \$110,969. The earnings for the half year were equivalent to \$17.12 a share on the 100,000 shares of no par value common stock outstanding after deducting preferred dividends. The earnings for the half year were larger than for any full year in the company's history. The balance sheet as of June 30 shows total current assets of \$9,179,849 and current liabilities of \$6,106,629, making a net working capital of \$3,073,220. The earnings for the last half of the year are not expected to approach those of the first half, however, because of the heavy slump in demand for trucks. The Republic plant has been closed for the past three weeks.

**Hendee Mfg. Co.** estimates net profits in the fiscal year ended Aug. 31, 1920, as equivalent to \$8 a share on its 100,000 shares of common stock. The company enters its new fiscal year without indebtedness. On Aug. 31 the company paid off all bank loans and floating debt, which at one time during the year reached \$850,000. Its inventory is marked down to current price levels. Prices on its product, the Indian motorcycle, have recently been increased \$50.

**New Castle Rubber Co.** stockholders have voted to increase the capital stock of the company from \$500,000 to \$3,000,000, which will be used for the present in perfecting its distribution channels throughout the country. It is planned to increase manufacturing facilities at a later date, which also will be provided for by the new capital. Most of the new stock will be common.

**Mullins Body Corp.**—Report for the six months ended June 30 shows earnings of \$723,341, profits after administration and general expenses of \$612,490 and a balance after a reserve for Federal taxes of \$28,062. The total surplus as of June 30 stood at \$2,244,999. The consolidated balance sheet shows cash amounting to \$623,225 and accounts payable of \$372,678.

**Black & Decker Mfg. Co.** announces that the entire block of \$250,000 of 8% cumulative preferred stock offered a short time ago has been subscribed by employees and that other subscriptions amounting to \$75,000 have been received. It now has been decided to increase the offering to \$400,000, all of which will carry a bonus of 25% in common.

**Gramm-Bernstein Motor Truck Co.** is selling \$2,000,000 in common stock to enlarge plant capacity. The first 20,000 shares are selling at \$12.50 and the remainder will probably be at a higher price. The company is capitalized at \$5,000,000. It is planned to double the annual production of 4800 trucks.

**Mason Tire & Rubber Co.** reports net earnings for the third quarter ended July 31 of \$152,011 and for the first nine months of the fiscal year of \$841,490. This is before deduction of taxes but after deduction for depreciation. Net earnings for the first nine months last year totaled \$195,000.

**Goodyear Tire & Rubber Co.** announces that sales for August exceeded \$19,000,000 as

compared with \$17,185,000 for July. This brings the total sales for ten months of the fiscal year to more than \$180,000,000 or \$13,000,000 in excess of the entire year of 1919.

**United States Malleable Iron Co.**, of Toledo, has increased its capital from \$350,000 to \$850,000. A portion of the stock will be distributed as dividends and the remainder will be placed on the market, according to Henry Eaton, assistant treasurer.

**Mesta Machine Co.**, Pittsburgh, has opened an office in the Singer Building, New York, from which all its foreign business will be handled. It will be in charge of M. M. Moore, export sales manager, and also will be the sales office for the Eastern territory.

**Peters Motor Corp.**, which will build a new type of low priced automobile, has decided to erect a factory at Trenton, N. Y. E. James Peters, of Pleasantville, N. J., is president of the company.

**Porter Rubber Co.** directors have formally approved a plan for the merger of their plant at Salem, Ohio, with that of the Ideal Tire & Rubber Co. of Cleveland. The plan now will be submitted to the stockholders.

**Mercer Motors Co.** in the three months ending March 31 reports a net income of \$152,763 before Federal taxes. This is at the annual rate of \$611,000, or approximately \$6 a share on outstanding stock.

**Pyramid Motor Equipment Co.**, New York.—Capital stock has been increased from \$15,000 to \$50,000 to expand its production and sale of automobile accessories.

**New Era Spring & Specialty Co.**, Grand Rapids, has shipped a car load of spring bumpers to customers in ten foreign ports.

**Locomotive Co.** will pay a regular quarterly dividend of 1% per cent on its preferred stock Oct. 1.

**Pierce-Arrow Motor Car Co.** will pay a regular quarterly dividend of 2 per cent on its preferred stock Oct. 1.

### GLAMORGAN RECEIVER NAMED

**COLUMBUS, Sept. 7**—Geo. R. Hedges has been appointed receiver for the Glamorgan Tire & Rubber Co., upon application of William O. McCormick, a stockholder, who represents a minority interest. Certain directors are charged with operating the company for their private benefit. The company was organized in October, 1918, with an authorized capital of \$500,000. The company has headquarters in Columbus with factories at Delphos and Oak Hill, O. Another factory is in process of construction at Byesville, O. Dr. Morgan Howell is president; Peter Jones, vice-president, and John J. Thomas, secretary.

### MASSACHUSETTS MOTORS CLOSED

**BOSTON, Sept. 7**—Pending the outcome of the bankruptcy proceedings against the Massachusetts Motors Co., Inc., the various branches of the company have been closed. The assets of the corporation are said to consist of \$30,000 in used cars, \$20,000 in furnishings and \$10,000 in other holdings, a to-

tal of \$60,000. The liabilities are said to approximate \$300,000.

Massachusetts Motors had the agency for six different cars in this city at various times. It also would take the sub-agency for any car at any time at Worcester, Springfield, Providence and Manchester, selling them all from the same salesroom. George W. Reed has been appointed receiver.

### Bank Credits

*Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.*

**NEW YORK, Sept. 9**—Wholesale prices continue to show a downward tendency, despite the recovery in a few special lines. The official crop reports are not so favorable as had been hoped for in some quarters. The corn crop is holding up well and promises to be one of the largest in our history, notwithstanding an indicated yield smaller than was estimated earlier in the season. The wheat and cotton crops, it now appears from official estimates, will yield less than formerly predicted. In the main, however, the estimated crop yields are far above the average for the last five years.

The weekly statement of the Federal Reserve Banks reveals a technical position still affected by the strong seasonal influences. Net deposits increased \$17,221,000 last week, and Federal Reserve notes in circulation were larger by \$39,633,000 than the figure for a week earlier. Bills discounted secured by Government war obligations increased \$18,062,000, while total bills discounted showed a net increase of \$69,336,000. Cash reserves decreased \$9,870,000. As a result, the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against net deposits, declined from 47.7 per cent to 46.6 per cent. Total earning assets increased \$75,264,000.

The New York Federal Reserve Bank showed a reversal, in that it became a borrower, whereas in previous weeks it had been a lender. It re-discounted \$47,500,000 of bills with other Reserve banks during the week.

The weekly statement of the New York Clearing House banks indicates a sharp reduction in loans and deposits. There was an increase in excess reserves over legal requirements of \$11,709,770, making the total of excess reserves \$25,942,820. Cash in vaults increased \$278,000. Net demand deposits declined \$21,323,000 and loans, discounts, etc., were less by \$21,972,000. Bills payable on Saturday stood at \$1,125,492,000.

The ruling rate on the local call money market last week stood at 8 per cent, as compared with 7 per cent the week before. The range was from 6 per cent to 10 per cent, as against 7 per cent to 10 per cent the previous week. Time money continued scarce, with little bidding, at rates of 8½ per cent on mixed collateral and 9 per cent to 9½ per cent on all-industrial security.



## Men of the Industry

**C. C. Hanch**, former general manager of the Maxwell Motor Car Co., has made no definite announcement of his plans for the future, but it is understood he is planning to open offices in New York and Detroit for consulting work in the general administration of automobile plants. Hanch resigned from Maxwell when the management committee headed by W. P. Chrysler took control. He went with the company when it was coming out of war work, and during his administration it turned out 85,000 passenger cars and trucks.

**W. S. Roberts**, who resigned as manager of the J. I. Case T. M. Co. at St. Louis to become distributor for the Reo cars and trucks in Kansas City, has returned to St. Louis as president and treasurer of the West Side Buick Auto Co., which will retail Buick cars at Kingshighway and Delmar Boulevard. This location is several miles from Motor Row and in the best residence district of the city. W. P. Kellam is associated with Roberts as vice-president and treasurer of the company.

**George T. Bryant** has been appointed general export manager of Robert H. Hassler, Inc. The export department of the company will be in full operation by Sept. 15, at which time Bryant will start his first trip to European countries. The itinerary includes England, France and Belgium. Bryant before going in for export work was a national figure in selling and advertising work. The Hassler company manufactures the Hassler shock absorber.

**T. B. Funk** has become chief engineer of the Utilitor division of the Midwest Engine Co. at Indianapolis. He began work on a small, cultivating type of tractor in 1911, and has been prominent in the small tractor field ever since. His first efforts resulted in the original drawings for what is now the Moline tractor. He spent several years with the Moline company, and then founded the Engineering Development Co.

**D. B. McCoy** has been made director of publicity for the British territory by the General Motors Export Co. and will make his headquarters in London. For the past three years he was advertising manager of the Olds Motor Works, and previous to that had been with the Buick Kansas City branch and the Oakland Motor Car Co., Pontiac.

**W. J. Muhlitner**, for several years associated with the Detroit Foundry Co., has organized the Automotive Castings Co., which has purchased the plant and business of the Merrill Manufacturing Co., Inc., of Imlay City, Mich. The corporation now is producing gray iron castings.

**H. W. Cross and F. R. Mead**, recent owners of the Mead Engineering Co., have formed the firm of Mead & Cross Co., with offices in New York, where they are engaged in the business of mechanical engineering and serving as direct factory representatives.

**Pem. M. Price**, former manager of the wholesale department of the B. L. P. Motor Co., has resigned to form the Price Rawn Motor Co., which will act as factory distributor in Washington, D. C., territory for the General Utility Co. of Philadelphia.

**Jules Haltenberger**, for the last five years chief engineer of the Briscoe Motor Corp. and designer of the new Briscoe, the model first shown at the New York Show of 1920, has resigned, effective Oct. 1. Haltenberger has not disclosed his future plans.

**W. H. Miles**, English engineer and inventor, is in the United States for a conference with the C. A. Shaler Co. relative to the marketing of his devices. He also plans to distribute Shaler vulcanizers and road lighters in Europe.

**G. M. Graves** has been made assistant sales manager of the Stewart Motor Corp. of Buffalo, according to announcement received in Detroit. He formerly was connected with Pierce-Arrow.

**C. A. Holdridge**, who resigned recently as chief engineer and sales manager of the Eastern Production Co., has organized the C. A. H. Battery Sales Co. to market a starting and lighting battery.

**A. S. Ward**, of the Timken-Detroit Axle Co., has been made assistant manager of the service division. Ward joined the Timken organization in 1916 and rose rapidly to his present important office.

**E. T. Bland** has resigned as works manager and chief engineer of the Topp-Stewart Tractor Co., Clintonville, Wis., and has gone upon a month's vacation in the northern Wisconsin woods.

**E. E. Rutter** has severed his connection with the Timken-Detroit Axle Co. after eleven years' service, and will engage in business for himself after a brief vacation.

**C. M. DuPuy**, president of the Pennsylvania Rubber Co., has been elected chairman of the board of directors of the Chelsea Exchange Bank, New York.

**Thomas P. Orchard** has severed his connection with the Arthur Knapp Engineering Corp. of New York.

### MULFORD JOINS PAIGE

**DETROIT, Sept. 4**—Ralph Mulford, famous race driver who has joined the Paige organization as a demonstrator, is en route to Denver where he will make his debut with Paige in the hill climbing contest at Pikes Peak, Labor Day. Mulford, who is 35 years old, began his career with the Lozier Company at Plattsburg, N. Y., when that company was building motor boats. Without mechanical training he developed an ability to handle and repair engines that quickly attracted the attention of his superiors, and he rose rapidly in the racing game. Mulford has participated in the most of the races at the Indianapolis Speedway since 1911.

### HAYES PROMOTES SOCIETY

**JACKSON, MICH., Sept. 4**—George Porter, tool room foreman, W. E. Hallet, plant engineer and M. B. Gilbert, of the publicity department of the Hayes Wheel Co., were in Jackson this week to promote an engineering society that will be extended to all divisions of the Wheel company. Among the benefits of membership will be scientific and financial assistance in developing ideas of worthwhile character.

The plan contemplates a circulating library covering all phases of construction necessary in the manufacture of automobile wheels, machinery, steel and tools.

An engineering course in the University of Michigan probably will be issued members of the society each year. Officials of all divisions of the Wheel company have approved the plan.

## Nixon Would Regulate Bus Transportation

**NEW YORK, Sept. 7**—Much impressed with the efficiency of the London motor bus service, Public Service Commissioner Lewis Nixon has returned from a six weeks trip to Europe. He declared buses are good public conveyances when subject to proper regulation and not operated on streets already served by electric lines. He talked with traction experts in London and Paris, and his observations will be embodied in a public report.

"The strongest impression that I have received," said Commissioner Nixon, "is that hit or miss legislation must be avoided. Personally, my general impression is that buses should not run on the same streets as those occupied by street railways.

"In many instances buses can do good work, but if they are to be permitted to enter seriously as a factor of transportation it should be under the most definite regulation and not under a 'guerilla' system, as now. The bus drivers here are doing about as they please."

### HARE'S STUDYING EXPORTS

**NEW YORK, Sept. 4**—Hare's Motors export department, which was established only last February, has established seven foreign distributorships and sent special representatives abroad to supervise the work in different sections. Other representatives will sail for South America and the Far East within 30 days. The products sold overseas will be marketed in strict accord with the domestic selling policy. Emphasis will be placed upon the fact that transportation is being distributed. The advertising department of Hare's Motors is planning an aggressive foreign campaign under the management of William Carl Chapman, formerly advertising manager of Packard Motors Export Corp. The export department is headed by E. J. Ross, Jr., former manager of the Government Division of the Locomobile Co.

### LARGER CARS POPULAR

**DETROIT, Sept. 3**—Demand for seven-passenger closed cars has increased in the last two weeks to such an extent as to cause much comment among automobile dealers and manufacturers. A few months ago, according to several well-known dealers, purchasers were asking for coupes and sedans of the five-passenger type. To-day, however, the demand is said to be for seven-passenger types. This situation is said to be especially noticeable with distributors and dealers in the resort towns along the lake shore. It also is true to a great extent with the dealers in the inland cities.

# Calendar

## SHOWS

- Sept. 18-25—Cincinnati, Annual Automobile Show, Passenger cars only, Cincinnati Automobile Dealers' Ass'n. Music Hall Buildings.
- Sept. 20-26—Los Angeles, National Tractor and Implement Show of the West, Tractor and Implement Dealers' Ass'n of Southern California, Guy H. Hall, Mgr.
- Sept. 27-Oct. 2—Buffalo, Closed Car Show, Buffalo Automobile Dealers' Ass'n, Elwood Music Hall, C. C. Proctor, Mgr.
- Oct. 4-9—Little Rock, Ark., Enclosed Car Show, Little Rock Automobile Dealers' Ass'n.
- Oct. 5-9—Minneapolis, Enclosed Car Show, Minneapolis Automobile Trade Ass'n.
- Oct. 6-16—New York, Electrical Show, Grand Central Palace, George F. Parker, Manager.

- Nov. 14-21—New York, Automobile Salon, Commodore Hotel Ballroom.
- Nov. 15-20—Chicago, Automotive Equipment Show, Coliseum, Automotive Equipment Association.
- Dec. 10-18—New York, Motor Boat Show, Grand Central Palace.
- Jan. 8-15—New York, National Passenger Car Show, Grand Central Palace, Auspices of N.A.C.C.
- Jan. 29-Feb. 4—Chicago, National Passenger Car Show, Coliseum, Auspices of N.A.C.C.
- Feb. 5-12—Minneapolis, Annual Automobile Show, Minneapolis Automobile Trade Ass'n.
- Feb. 6-12—Columbus, National Tractor Show, Columbus Tractor & Implement Club, Ohio State Fair Grounds.

## FOREIGN SHOWS

- October—London, Commercial Vehicle Show, Olympia.
- Nov. 4-13—London, International Motor Exhibition, Society Motor Mfr's and Traders, Ltd., Olympia and White City.
- Nov. 6-13—Christchurch, N. Z., Olympia Motors Exhibition.
- Nov. 29-Dec. 4—London, Cycle and Motorcycle Show, Cycle and Motorcycle Mfr's and Traders Union, Ltd., Olympia.
- Jan. 7—Sydney, Australian Motor Show.

## CONTESTS

- Sept. 17-18—Syracuse, N. Y. Dirt track.
- Sept. 25—Allentown, Pa. Dirt track.
- Oct. 1-2—Trenton, N. J. Dirt track.
- Oct. 8-9—Danbury, Conn. Dirt track.

## CONVENTIONS

- Sept. 16-17—Cleveland, Motor and Accessory Manufacturers' Ass'n. Credit Convention.
- October—Cleveland, Service Managers' Convention, National Automobile Chamber of Commerce.
- Oct. 11-13—Chicago, National Association of Purchasing Agents' Annual Convention.
- Oct. 20-22—Atlantic City, Twenty-seventh Annual Convention National Implement and Vehicle Association, Hotel Traymore.
- Dec. 7-10—New York, Annual meeting American Society of Mechanical Engineers, Engineering Societies Building.
- Dec. 8-9—Cincinnati, Annual Convention, Ohio Automobile Jobbers' Association.
- Jan. 11-13—S. A. E. Annual Meeting, New York City.

## Girls Learn to Run Farming Machinery

CARLINVILLE, ILL., Sept. 4—Education of girl students in power farming has been inaugurated upon an extensive scale by Blackburn College. This is said to be the only educational institution in the Middle West which has made this addition to the curriculum for the weaker sex. It occurred to the trustees that there might be many instances where girls or young women might be suddenly called upon to assume the responsibilities of operating a farm.

The war demonstrated a need for power farming instruction for girls and President William M. Hudson believes in practical instruction and self help. There is nothing of the aristocratic about Blackburn. The girls who enter are given to understand that it is largely work and that playtime is limited. Each girl, who takes the new course, in addition to the instruction in power farming, is taught how to cook. The girls are also instructed in housework and in the care of their dormitories.

Three girls are assigned to each tractor, disk and harrow, working under the watchful eye of a skilled instructor. They are taught the principles of power farming from all angles. While it is real work to handle a tractor, disk and harrow, the girls enjoy it and are apt students. They are quick to learn and readily grasp the mysteries of carbureters, spark plugs, crankcases, cylinders, etc.

## OHIO JOBBERS TO MEET

COLUMBUS, OHIO, Sept. 9—The annual meeting of the Ohio Automobile Jobbers Association, an organization of jobbers in automobile supplies and accessories, will be held at Cincinnati Dec. 8 and 9. This convention will be held in conjunction with the annual meeting of the Ohio Automotive Trade Association,

which will extend from Dec. 8 to 10. The Ohio Automobile Jobbers Association consists of 12 members in all parts of the State and has become a strong association among the jobbers. J. C. Hipp of Cleveland is president; Chelsey York of Greenville, vice-president; Curtis Sohl of Columbus, secretary, and H. C. Bronner of Cincinnati, treasurer.

## Lexington First in Pike's Peak Climb

COLORADO SPRINGS, Sept. 7—The Pike's Peak hill climbing contest was won yesterday by a Lexington Special, driven by Otto Loesche. The time was 22:25 2/5. Another Lexington Special driven by Arthur Cline was second in 22:30 4/5. Ralph Mulford, who won the event in 1916, was wrecked at the 14-mile post by skidding off the road, but was not hurt.

Eighteen cars competed. They were divided into three classes, according to piston displacement. The third class, or unrestricted displacement entries, started first. They were followed by the second class consisting of those with displacement of 183 cu. in. or less. The third class was made up of those having engines of 184 cu. in. or more.

## WELLMAN TO BUILD TRACTOR

AKRON, Sept. 3—Wellman-Seaver-Morgan Co. will erect a tractor factory near Akron, adjoining the A. C. & Y. railroad tracks. The plant will employ 10,000 men and work on its construction will begin immediately. No statement was made as to the cost of the plant or even the first unit, but officials say several millions will be required to complete the factory construction. The Wellman-Seaver-Morgan Co., which manufactures boilers and heavy machinery, is one of Akron's oldest concerns and during the war manufactured large quantities of heavy machinery.

## West Virginia Farms Lacking in Tractors

WASHINGTON, Sept. 7—There are only 3500 tractors on the 200,000 farms in West Virginia, or approximately only one tractor to every 180 farms in that State, according to a report by Henry M. Taylor, agricultural statistician, to the United States Bureau of Crop Estimates. Twenty-seven makes were reported by owners.

Some of the tractors, it was shown, have been in use three years; a large number over two years, but the greatest number less than one year. One large distributor reports nearly 50 per cent of his sales as occurring since Jan. 1, 1920.

Owners are almost unanimous, the report declares, in remarking that the tractor has been of invaluable assistance in enabling them to maintain or increase their cultivated acreage. A feature of the report is that none of the mountainous counties of the State were found to number any tractors.

## WILLYS OPENS SALES CAMPAIGN

WILKES-BARRE, PA., Sept. 4—"A saturation point in automobile sales is no more possible than with boots and shoes," asserted Robert Malone, factory representative of the Willys-Overland Co., before a body of Overland salesmen from eleven counties, at a banquet in the Hotel Redington. The main object of the gathering was to introduce the company's \$30,000 prize salesmanship contest covering the next sixty days.

S. L. Fenstermacher, head of the Overland branch here said he would give a bonus to every man on his staff who makes the trip to Toledo in November, which is part of the reward offered by the Overland company to the winning salesman. The exact problem confronting the Toledo company, he said, was that of distributing 28,000 automobiles through 5,000 dealers in 60 days.



# AUTOMOTIVE INDUSTRIES

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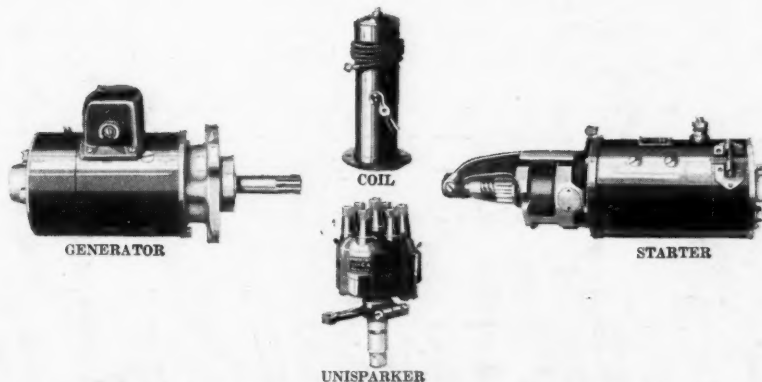
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wonder, too, that the Continental organization derives unusual satisfaction from the value that the automotive world attaches to its product—little wonder that it is united more firmly than ever in its resolve to let nothing interfere with the maintenance of high quality standards in the motor that is marketed under the Continental Red Seal.

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